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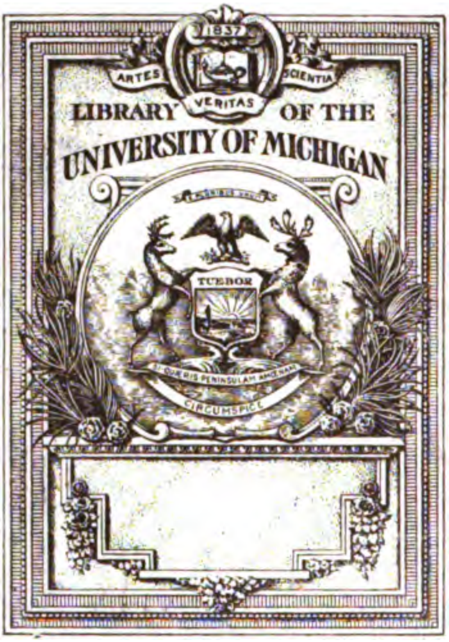

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OF

Gt. Brit.

THE LOCAL GOVERNMENT BOARD,

1894–95.

SUPPLEMENT

CONTAINING THE

REPORT OF THE MEDICAL OFFICER

For 1894–95.

Presented to Parliament by Command of Her Majesty.

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PUBLIC HEALTH.

ANNUAL REPORT

OF THE

MEDICAL OFFICER

OF

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FOR THE YEAR

1894-95.

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REPORT.

TO THE RIGHT HONOURABLE HENRY CHAPLIN, M.P.,
PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

MEDICAL OFFICER'S REPORT.

SIR,

I HAVE the honour herewith to submit to you, for presentation to Parliament, my annual report on the proceeding of the Medical Department of the Board during the year 1894–95. I have already laid before you a separate report together with papers on the Port and Riparian Sanitary Survey of England and Wales.* This survey, commenced in 1892, was continued through 1893 and 1894. Early in 1895 it was decided that, in view of the continued danger to this country by reason of the maintained prevalence of cholera on the continent of Europe, it was advisable to retain for a further period of one year the services of two of the four temporary Medical Inspectors who had been appointed at the commencement of 1893. Under this decision Dr. Samuel W. Wheaton and Mr. Evan Evans remained in the service of the Board.

In February 1895 the Board received the resignation of Dr. Hubert Airy, M.A., their senior Medical Inspector. This circumstance was brought about by reason of maintained ill-health, a reason which had on two occasions prevented Dr. Airy from accepting the Board's offer of promotion to the post of Assistant Medical Officer. Dr. Airy brought to bear upon his official work very considerable abilities, together with a rare combination of courtesy and mental culture; and in accepting his resignation the Board expressed their regret that the Department would, in the future, be deprived of the valuable services which he had rendered them for five and twenty years. Dr. F. W. Barry succeeded Dr. Airy as Senior Inspector, and the vacancy thus created was filled by the appointment to the post of Medical Inspector of Dr. George Seaton Buchanan, son of the late Sir George Buchanan, my immediate and distinguished predecessor.

I.—*ADMINISTRATIVE RELATIONS OF THE MEDICAL DEPARTMENT.*

1. VACCINATION AND PUBLIC VACCINATION.

VACCINATION

The digest of the Vaccination Officers' returns to which this report relates has to do with the condition as regards vaccination on the 31st of January 1894, of 798,205 survivors out of 890,695 children whose births were registered in England and Wales in the year 1892. (Appendix A. No. 1.) Of these 890,695 children 132,539, or 14·9 per cent., were not finally accounted for, including 13,278, or 1·7 per cent. having had their vaccination postponed under medical certificate. In the metropolis the amount of default reached 18·4 per cent., and in the provinces 14·3 per cent.; both these rates being more than double those which were obtained six years previously, when that progressive failure on the part of many Poor Law Guardians properly to enforce the provisions of the Vaccination Acts, which has characterised recent years, may be regarded as having definitely set in.

---

* Reports and Papers on the Port and Riparian Sanitary Survey of England and Wales 1893-4, with an Introduction by the Medical Officer of the Local Government Board [C.—7812], 1895.

INSPECTION OF PUBLIC VACCINATION.

During the year 1894, 227 Unions were inspected for the purposes of Public Vaccination. These Unions included 1,170 Vaccination Districts, and the work performed in 785 of these was such as to call for the grant of the special award which the Board have power to confer under section 5 of the Vaccination Act, 1867. (Appendix A. No. 2.)

On the 28th July 1894, Alexander Carson Clarke, M.D., was appointed teacher and examiner at the Educational Vaccination Station in connexion with the Manchester School of Medicine, in succession to the late Ellis S. Guest, M.R.C.S. So also on the 31st of October 1894, the Board sanctioned the establishment of a new Educational Vaccination Station in connexion with the Medical School of Aberdeen, and appointed Robert Gordon McKerron, M.B., M.S., as teacher of vaccination at that station.

NATIONAL VACCINE ESTABLISHMENT.

A detailed account of the proceedings of the National Vaccine Establishment will be found in Appendix A. No. 3. Humanised lymph was sent out in 6,878 capillary tubes and on 224 ivory points; and calf lymph was sent out on 14,029 ivory points and in 78 capillary tubes. This distribution and use of preserved lymph, whether humanised or from the calf direct, is as far as practicable limited to the purposes of starting new series of vaccination with fresh lymph from arm-to-arm. At the Board's Station at Lamb's Conduit Street vaccination is performed direct from calf-to-arm; and experience from that station comes anew to emphasise the importance of resort to absolutely fresh lymph whenever this is practicable. Thus, Dr. Cory reports that in the year 1894–95, 263 calves were vaccinated with lymph direct from other calves with an insertion success of 94·6 per cent.; whereas in a few cases in which stored calf-lymph was used the insertion success was only 68·1 per cent. (Appendix A. No. 4.)

During 1894 the number of infants and others who received primary vaccination at the Calf Station was 7,202, and not one of these was found to be "insusceptible." This raises the number of persons, who, in a long series of consecutive years, have been vaccinated by the Board's own vaccinators, without the occurrence of a single case of insusceptibility, to no less than 88,875. But, on the other hand, the number of children certified to be insusceptible in England and Wales during 1892 reached no less than 1,983 out of a total of 665,640 who were submitted to the operation.

2. OTHER ADMINISTRATIVE BUSINESS OF THE MEDICAL DEPARTMENT.

CONFERENCES AND LOCAL INQUIRIES.

The current work of the Medical Department has, as heretofore, included numerous conferences at the office, with local authorities or their representatives, on matters relating to the application of codes of byelaws to particular localities, to the planning and construction of isolation hospitals, and to other allied matters. In response to an exceptional demand by local authorities for sanction to loans in connexion with the purchase of hospital sites and the construction of hospitals for infectious diseases, Medical Inspectors have conducted local inquiries in no less than 64 districts, namely:—Acton and Hanwell (Joint Hospital), Alderbury (Rural), Barking Town, Barry and Cadoxton (Port), Basford (Rural), Batley, Birmingham, Bradford (Yorks), Bridport, Bristol, Bromyard (Rural), Burnley (Joint Hospital), Burton-on-Trent, Canterbury, Chadderton, Chesterfield, Croydon, Dorchester, Epsom (Joint Hospital), East Grinstead, Farnworth, Featherstone, Gateshead, Guildford (Joint Hospital), Halstead, Hendon (Rural), Herne Bay, Hertford and Ware (Joint Hospital), Heywood, Hornsey, Keighley and Bingley (Joint Hospital), Kettering (Joint Hospital), Kingston-on-Thames, Leeds, Leigh, Liverpool, Newport (Mon.), Northampton, Ossett, Penzance, Pontefract, Reigate (Rural), Richmond (Surrey), Rochester, Rothwell (Yorks), Shipley, Southborough, Southend, South Hornsey, Stapleton, Sunderland (Rural), Thornhill, Tunbridge Wells, Upton-on-Severn and Pershore (Joint Hospital), Walthamstow, Watford (Rural), West Ham, Whitby, Isle of Wight (Rural), Worcester, and York.

Inquiries have also been made as to the question of issuing orders under section 42 of the Public Health Act, 1875, in reference to the matter of scavenging; as to proposals for the provision of means of disinfection; as to action taken on the occasion of theatenings of small-pox in London and elsewhere; as to notified cases of suspected cholera; and as to the propriety of dealing with certain properties under the Housing of the Working Classes Act. Dr. Copeman has also continued to collect evidence concerning the Epidemic Skin Disease on which he reported last year.

In a number of instances detailed inquiry and report have been made in particular places, either as to the incidence of disease upon them, or as to the character of the local sanitary administration (Appendix A. No. 5). Thus, the prevalence of fatal diphtheria was inquired into at Barnham Broom in Norfolk by Mr. T. W. Thompson; in the Barnstaple, Bideford and Ilfracombe Urban, and the Barnstaple and Bideford Rural Districts by Dr. Reece; at Hastings and at Broadstairs by Dr. Bruce Low; at Crofton in Kent, and at Potterne (Wilts) by Dr. Copeman; in the Hinckley Urban and Rural Districts by Dr. Wheaton; in the villages of Hythe and Bramshaw (Hants) and at Linslade (Beds) by Dr. Bulstrode; at Long Benton in Durham by Dr.

Sweeting; and at Rainham in Essex by Mr. Evan Evans. Prevalences of enteric fever were inquired into in the Desborough Urban District, Northamptonshire, by Dr. Fletcher; in certain parts of the county of Durham by Mr. T. W. Thompson; at Mold by Dr. Wheaton; in the New Delaval Colliery Village in Northumberland by Dr. Sweeting; in the borough of Newport, Isle of Wight, by Dr. Dr. Theodore Thomson; and at Widnes in Lancashire by Dr. Bruce Low. Other somewhat similar inquiries were undertaken as to a prevalence of typhus fever at Bury in Lancashire by Dr Copeman; as to a severe outbreak of small-pox in and near Hastings by Dr. Bruce Low; as to scarlatina at Hucknall Torkard (Notts) by Dr. Horne; as to a prevalence of anomalous illness associated with cerebro-spinal, pulmonary and throat symptoms at Laxfield in Suffolk by Dr. Bruce Low; as to pollution of the public water supply at Penrith by Dr. Bruce Low; and as to the alleged re-introduction of scarlatina into households by patients discharged as cured from the Bromley and Beckenham joint hospital for infectious diseases, by Mr. T. W. Thompson. Some of these inquiries were instituted at the request of the district councils concerned; others were made on local complaint; and others again on information reaching the Board by means of the statistical returns of the Registrar General, of reports of local sanitary officers, and otherwise. The reports on these inquiries, when completed, were submitted to the Board, and they were in almost all cases subsequently transmitted to the district councils concerned, forming the basis of advice or at times of remonstrance on the part of the Board. Several of these reports, involving, as they do, considerations and interests of a general as well as of a local character, call for more detailed notice. They are also reproduced in the Appendix to this report.

ENTERIC FEVER AT NEWPORT, ISLE OF WIGHT.

In the autumn of 1894 a serious epidemic of enteric fever set in at Newport in the Isle of Wight. After the appearance of only three attacks of enteric fever in the first four months of the year, there had occurred an unusual amount of that disease in the borough during the period May–September, with a distinct tendency to marked increase during the latter part of August and the whole of September; this increase being followed by an explosive outbreak, which led during the three fortnightly periods ending October 16th, October 30th, and November 13th respectively, to no less than 100, 109 and 79 fresh attacks in addition to a number of cases deemed to be of a somewhat doubtful character. In the fortnight ending November 27th 45 fresh attacks were heard of, and after this the epidemic subsided. Between May and December, both inclusive, there occurred, in this borough, 433 attacks of enteric fever, 32 attacks of a doubtful character, with 42 deaths.

The population of Newport was, at the time, estimated to be 10,512, and adding to the 433 cases the three which occurred in the earlier part of the year, we have 436 attacks from enteric fever, or an attack rate for the year of 41·5 per thousand living. But Newport did not stand alone in this outbreak. During the period of the greatest incidence of the fever on the borough, the disease attacked parts of the rural sanitary district adjacent to it, notably the villages of Carisbrooke and Gunville, causing 44 cases of enteric fever, six attacks the diagnosis of which was deemed doubtful, and seven deaths; Parkhurst Barracks, immediately to the north of the borough, had on a population of 700 persons, nine attacks of enteric fever and three attacks of a doubtful character, all of which ended in recovery; and Parkhurst Convict Prison closely adjacent to the Barracks, and containing at the time 1,131 persons, had 27 attacks of enteric fever, two cases deemed to be doubtful, and two deaths. Including with the recognised attacks of enteric fever, the attacks resembling that fever, but as to which the diagnosis was deemed to be doubtful, there occurred in Newport and its immediate surroundings during the period May—December 1894, 556 attacks and 51 deaths.

As soon as this prevalence of fever came under the notice of the Board, Dr. Theodore Thomson was instructed to inquire into its circumstances, and his report will be found in Appendix A. No. 6 to this volume. In searching for the cause of the outbreak in the several localities referred to, Dr. Theodore Thomson held in view the fact that no fever agency could be regarded as satisfactorily accounting for the epidemic, unless it also sufficed to account for its coincidence in point of time in the several areas concerned. No such explanation could be found in the several conditions of the sewerage; for three separate and altogether independent sets of sewers were in question, whilst part of Carisbrooke, and the whole of the village of Gunville had no sewers. General sanitary circumstances, and milk supply had likewise to be eliminated from the list of possible causes; indeed, in Newport alone, customers of 42 milk vendors had contracted the disease, 14 different milk sources came into play in the rural district, and both the prison and the barracks had independent supplies.

But it was otherwise when the question of water supply came under consideration. The Borough of Newport has a public water-supply which is in the hands of the Corporation; the supply being derived from two wells sunk in the Upper Chalk, and from adjacent springs which come to the surface at the eastern extremity of Carisbrooke village, near the south-western corner of Newport. Out of a total of some 2,260 inhabited houses in the borough, all but about 50 receive the public water-supply, and on inquiry it transpired that of the 436 attacks of enteric fever in the borough, 432 occurred amongst consumers of this public service, whilst only four are not known to have drunk it. In Carisbrooke the Newport water is laid on to 121 out of a total of 159 houses, and only two cases of enteric fever occurred amongst persons not known to have been consumers of this water. In Gunville 67 houses receive the Newport water, whilst 29 have other local supplies; but all who were attacked with the fever in this village, are known to have been users of the public water service. Both Parkhurst Convict Prison and Barracks are throughout supplied with water from the Newport mains. Indeed, not only were the operations of the Newport water-supply co-extensive with the area of the distribution of the fever, but although it consisted of two apparently distinct parts, known respectively as the high-level and low-level services, yet both these services were open to specific pollution at their sources, and pollution of the high-level service almost necessarily involved the distribution at one and the same time of the polluted water over the entire area of the Newport mains. And further, no other agency known to have elsewhere served in the dissemination of enteric fever answered, in and about Newport, to these two requirements of time and area.

The wells and springs in Carisbrooke from which the Corporation of Newport derive their water supply, are close to a considerable aggregation of houses; indeed the majority of the population of Carisbrooke village reside within a quarter of a mile of the works. The wells are shallow ones, as chalk wells go; they have only a depth of 23 feet and 27 feet respectively above the bore-holes; and one of them has hardly a pretence against soakage from the surface Chalk. The Carisbrooke houses mostly stand on Chalk, and the drainage of many of them is into cesspools which are sunk to a depth of 6 feet to 20 feet into the same formation, and are so contrived as to permit soakage of their contents into the surrounding soil. The natural trend of the underground water in the Chalk at this point is such that it would encounter on its way to the waterworks some of these leaking cesspools, and the effect of pumping would tend to draw water and cesspool soakage from a still wider area. A mill-pond, receiving cesspit and other like filth, was also found in dangerous proximity to both wells and to a reservoir; indeed, so obvious was it that the mere physical circumstances of this public water supply constituted in themselves risk of danger to the water, that it hardly needed the convincing proof which was afforded by the lithium test on the one hand, and by bacteriological investigation on the other, to show how obvious was the ever recurring chance, if not certainty, of its pollution by the excreta of man and animals.

It is now 27 years since my predecessor, Sir John Simon, expressed the opinion* that the time had arrived for defining and affirming the precise nature of the liability which should attach to "commercial water companies," whether local sanitary authorities or not, who in their capacity as public purveyors could be held responsible for "certain sorts of malfeasance," in matters affecting "the fixed and finished parts of sanitary

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* Tenth Report of the Medical Officer of the Privy Council, with Appendix, 1867.

" science, as distinguished from those which are in any degree " uncertain and speculative." In reporting on this Newport case Dr. Theodore Thomson says:—" The capacity of the " specific contagion of enteric fever to travel afar through " pervious strata such as the Upper Chalk, and thus to pollute " even distant water supplies, is well known." The danger, too, " was near and pressing"; and yet it is only after the occurrence of this grave epidemic that we learn that remedial measures, so long and so obviously called for, came to be provisionally adopted, and that the town council had decided to seek for future distribution a supply of water that shall not be exposed to dangerous pollution.

ANOMALOUS FEBRILE ILLNESS AT LAXFIELD.

In reporting to the Board on the proceedings of the Medical Department for the year 1891-92,* I drew attention to an outbreak of anomalous febrile illness which had been investigated by Dr. Bruce Low in certain Northamptonshire villages, notably in Raunds. A somewhat similar occurrence took place at Laxfield in Suffolk during the month of April 1894. This latter outbreak was made the subject of careful investigation by the same Inspector, and his report on it will be found in Appendix A., No. 7. In a parish of some 900 people, 66 recognised attacks of illness of the kind in question occurred in 32 households; 62 of the attacks taking place in the fortnight ending April 15th. As was the case at Raunds, the incidence of the malady was almost solely on infants and on children under ten years of age; and the leading features of the disease, in both instances, were vomiting, drowsiness, fever, diarrhœa, herpes of the lips, sore throat, bronchitis or pneumonia, retraction of the head, and coma at times ending in death.

As at Raunds so also at Laxfield there was evidence that the disease was a communicable one; thus, at Laxfield there were subsequent cases reaching 34 in number in 28 of the households invaded. Other manifestations, such as the occurrence of a red rash, enlargement of the parotid glands, epistaxis, &c., were less common to both groups of patients; but examination of the clinical features of the two outbreaks, as set out by Dr. Low in parallel columns, will show that between the two occurrences there was much resemblance.

Both in Northamptonshire and at Laxfield there was considerable difference of opinion as to the precise nature of this anomalous illness. In 1891, and again in 1894 at Laxfield, Dr. Low had strong suspicion that the disease was allied to epidemic cerebro-spinal meningitis; and in considering how far the malady might have been related, as was implied by some, to epidemic influenza, he recalls the fact that certain writers have suggested that after all, epidemic influenza may possibly be a manifestation, or, so to speak, a "sport" of cerebro-spinal fever.

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* Supplement by the Medical Officer to the Annual Report of the Local Government Board for 1891-92 [C.—7050], 1893.

MEDICAL OFFICER'S REPORT.

SMALL-POX IN AND AROUND HASTINGS.

Another report deals with an occurrence of small-pox in and around the borough of Hastings (Appendix A. No. 8). It is of interest in several respects but its main interest may be regarded as having to do with the diffusion of small-pox to people living in the neighbourhood of a small-pox hospital, and this apart from any communication with infected persons or things that could be traced as the result of a most painstaking inquiry. Some of those attacked with the disease were inmates of the workhouse, an entirely separate institution situated at a distance of about 250 yards from the small-pox hospital. According to Dr. Bruce Low, no explanation could be found of the development of the first cases in this workhouse except on the theory of aerial convection of the small-pox poison.

The question as to the circumstances under which diffusion of small-pox in the neighbourhood of small-pox hospitals takes place has arisen anew in a number of instances during the past few years; and convincing proof has been afforded that notwithstanding the acknowledged necessity for taking precautions, as to the isolation of the sick and other infected persons as well as infected things, in the case of small-pox, beyond anything that is held to be necessary in the case of the other infectious fevers, yet diffusion of the small-pox infection beyond the limits of the buildings in which that disease is isolated has become an almost common occurrence. I do not propose here to discuss the question as to whether such diffusion is always brought about as the result of "aerial convection," a term which has come into use since Mr. Power's well-known investigations into this subject; but I would point out that the aerial diffusion of small-pox is not a matter that calls for any proof. It is a thing of everyday occurrence; indeed, I am not aware that the infection of small-pox differs, otherwise than in potency, from that of our other current specific fevers in this respect; and I have never heard suggestions that, when an individual contracts small-pox after exposure to that disease, whether in the wards of an hospital or elsewhere, the dissemination of the infection takes place in any other way than through the medium of the air. The differentiation sometimes made between contagion and infection in the case of this disease, does not appear to me to have any significance whatever in so far as the everyday method of the diffusion of small-pox is concerned. Indeed, the only questions that involve difficulty in this connexion seem to be to determine the distance through which the small-pox infection can be conveyed aerially, before losing its ability to impart that disease, and the circumstances which govern at different times its more or less wide distribution.

Pending the solution of this difficulty, and having regard to steadily accumulating experience of mischief to communities and persons by reason of small-pox hospitals, the Board have, in a new issue of their memorandum "On the Provision of Isolation Hospital Accommodation by Local Authorities," laid down certain

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conditions of population and area within the limits of which local authorities should not contemplate the erection of a small-pox hospital. This memorandum will be found in Appendix A., No. 11.

"RETURN CASES" OF SCARLATINA.

Along with the growing practice of removing persons suffering from scarlatina to isolation hospitals a tendency has, from time to time, been manifested for scarlatina to reappear in households shortly after the return to them of persons who had been treated for that disease in hospital, and the term "return cases" has come to be applied to such secondary invasions of households as might, in point of time, have had relation to hospital procedures. The hospital belonging jointly to the Bromley and Beckenham District Councils having come under the notice of the Board in this connexion, Mr. T. W. Thompson was instructed to confer with representatives of the Joint Hospital Board and of the District Councils concerned as to the circumstances under which scarlatina had manifested itself anew in certain households to which patients from this hospital had from time to time been returned.

As a result of such conference Mr. Thompson ascertained that in the course of a particular epidemic affecting the sanitary area in question, households from which persons suffering scarlatina had gone to hospital, had, as a matter of fact, been more liable to occurrence in them of a plurality of attacks than other households in which the first sufferer or sufferers had been treated at home; and that, in particular households the second person to fall ill had done so at a time and under circumstances directly suggestive that the fresh illness had been caused by the return home of a hospital patient. But Mr. Thompson also found that, irrespective of secondary cases which might primâ facie be referred to infection re-imported in this way, households of the class which sent their fever inmates to hospital suffered secondary invasion in excess of households where the initial sufferer was treated at home. And he inferred, therefore, that for some reason or other, apart altogether from any influence that could be referred to hospital, households of the class sending their inmates to the hospital were prone beyond the other class of households to invasion by scarlatina.

Thus the question arose for Mr. Thompson:—How far had re-invasion of households locally referred to "return cases" been actually due to the return of a hospital convalescent, or had, on the other hand, been brought about by other agencies of scarlatina operating especially on the class of persons among whom removal to hospital on their attack by the disease was the customary procedure.

As the result of careful consideration of the facts brought before him, Mr. Thompson arrived at the conclusion that whilst a distinct proportion of the re-invasions which formed the subject of conference was due to the return of hospital patients, it was, nevertheless, not improbable that some other and unknown proportion of these cases was due to agencies referred to as

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operating especially on the hospital class of households. Respecting the nature of these agencies, questions as to the general character of the households of the class which send patients to hospital and of the excess in that class of household of persons at the ages most susceptible of scarlatina, and of scholars at public elementary schools, were in turn considered. Each of these was regarded as having had some share of the excessive incidence of secondary scarlatina on the class of households in question, yet neither these nor any commonly accepted agencies, including the return to their homes of hospital convalescents, could satisfactorily account for the relative excess of secondary scarlatinal invasion of households at one particular period of the epidemic.

In regard to cases presumably due to the return of patients from hospital, there did not appear to Mr. Thompson sufficient evidence to show the extent to which, if indeed at all, such cases were attributable to defective hospital administration, though it seemed not improbable that overcrowding of the hospital wards —such as might well tend to prolong the state of infectivity in individual patients—had contributed to the production of these cases. On a balance of considerations, the influence of season, and of the stage of the epidemic are regarded by him as having probably had important concern with the occurrence of these "return cases." Indeed, he shows that with decadence of the epidemic the percentage of secondary invasions, however induced, to total households, underwent notable decline.

Mr. Thompson discusses these and other points in the course of his report; but that report does not, in view, amongst other considerations, of the smallness of the figures concerned, profess to afford any definite solution of the matter under investigation. It may, however, afford indication to other investigators as to the lines of research most likely to afford promise of useful results in respect of the significance of these so-called "return cases" of scarlatina, and for that reason it is reproduced *in extenso* in Appendix A., No. 9.

ON THE CONTROL OF MEASLES.

The prevalence of and the mortality from measles in England and Wales, and the measures that may be and which have been adopted by sanitary authorities with a view to obtaining control over this disease, form the subject of a special report by Dr. Theodore Thomson (Appendix A., No. 10).

The question of measles as a cause of death in this country, has engaged the attention of the Medical Department for several years; and its importance is indicated in a number of considerations, statistical and other, which are set out by Dr. Thomson in the introduction to his report. The death-rates from most of the diseases of the zymotic class have continuously decreased decade by decade, whereas that from measles has undergone no diminution. Measles has, indeed, except during the last few years, exhibited a general tendency to increase, and even during the quinquennium 1890-94 the death-rate from this disease now stands at a figure higher than that for any other disease of the zymotic class, except whooping cough and diarrhœa. The sum total of the deaths registered as due to measles in England and Wales during the ten years 1885–94, reached no less than 129,496; or a yearly mean of 12,950. Now, as formerly, measles is a disease the mortality from which falls almost exclusively on children; especially is it fatal to infants in the second year of life. This is the more noteworthy since, relatively to their number, children aged two to five years would appear much more prone to measles attack than other persons or than infants under two years. The mortality from measles is much greater in town than in country places, the disease being more often epidemic in towns, where the opportunities for intercommunication between the healthy and the sick are more abundant than in rural areas.

In view of these and other considerations, it appeared desirable to take account of those measures that are likely to avail urban or rural authorities in the prevention of measles, measures designed to meet epidemic prevalence of the disease, or directed towards obtaining such control over measles on its appearance in a district as to arrest or delay a threatened epidemic. The importance of control of the latter sort is apparent on consideration of the age at which measles is most fatal. If, in any district, measles which formerly was epidemic every other year be so far discouraged by preventive measures as to acquire epidemicity only every fourth year, it is clear that a larger number of susceptible children will, when the epidemic arrives, have reached ages at which the disease is little fatal, and that in this way many lives will be saved which formerly were sacrificed to measles.

Dr. Thomson records the experience acquired in the matter of dealing with measles in certain sanitary areas which had been thought of as likely to afford useful information as to the measures best adapted to the control of this disease. The districts in question were 33 in number (22 urban and 11 rural), and their circumstances have been closely studied by Dr. Thomson, at one and another time, as his more pressing duties have permitted, in the course of the past five years.

In setting out, for the guidance of sanitary authorities desirous to obtain control over measles, those preventive measures which are to be thought of as practicable for this purpose, Dr. Thomson has throughout kept in view the special difficulties which attach to the dealing with this disease by way of prevention. Prominent among these difficulties are, on the one hand, the extremely infective character of measles—especially in the early stages before the nature of the disease is declared—and, on the other, the slight estimation in which measles is held by the general public. These and other considerations must needs modify materially the application to measles of preventive measures such as are successfully employed in connexion with other and less fatal infectious diseases. Thus, the first step in the prevention of measles must be to obtain accurate knowledge of persons attacked by it, and to this end measles can be, and in certain districts has been, scheduled among diseases to be compulsorily notified under the Infectious Disease (Notification) Act, 1889; but Dr. Thomson points out that it is not to be expected—and it has not occurred in practice—that such compulsory notification will bring to the knowledge of the sanitary authority anything like the total of persons attacked by a disease like measles, in which so large a number of attacks never come under medical treatment. Not only must knowledge derived from this source be systematically supplemented from other sources, but each case heard of by compulsory notification, or from these other systematic sources of information, must be made the subject of a personal visit and inquiry, in order that associated cases which would otherwise remain unknown to the sanitary authority may be detected.

Again, dealing with measures for restraining the spread of measles in invaded households, Dr. Thomson indicates that the attention paid to such households by the authority must needs be greater, as the estimate of the gravity of the disease on the part of the public is less. Little representation from a sanitary authority may be necessary to secure proper isolation, disinfection, and other necessary precautions in the case, say, of a disease so much feared by the public as small-pox; but at houses invaded by measles, it is necessary that repeated and detailed inquiries should be instituted by the sanitary officers, in every case, if the spread of the disease from such houses is to be adequately controlled.

So, too, with regard to checking the extension of measles in an invaded district. Measures for this purpose available for a sanitary authority have reference principally to the operations of schools. In view of the infectiousness of measles, and the difficulty of recognising it in its earlier stages, any information as to this disease given by the school authority to the sanitary authority or by the latter to the former must, in order to be efficacious, be of the completest character. If preventive measures as regards schools are to be of avail, they must be contrived to secure the systematic exclusion from school of all children from any house which is invaded by measles, and they may even, on occasion, have to be extended to exclusion of children living in the neighbourhood of invaded houses. For the same reason, if, on account of any exceptional prevalence of measles, general closure of public elementary schools has to be resorted to, a similar measure requires to be applicable to all schools in the invaded neigbourhood, to Sunday and private schools as well as to public elementary schools, and to other gatherings of children, before real advantage can be expected from the proceeding.

Taking as a basis the practicable measures of prevention which he has formulated, Dr. Thomson proceeds to consider in regard of each of the 33 districts visited by him, how far such measures of prevention have been adopted by the sanitary authorities, and to what extent profit has in each instance resulted therefrom.

Unfortunately, he is unable to point to any one district as having systematically adopted all practicable measures of precaution for the prevention of measles; but the facts recorded go to indicate that in so far as, in particular districts, the difficulties of the problem have been realised, and in so far as the comprehensive character which must attach to any effectual measures directed against measles has been understood, by so far have the results obtained been found encouraging to the sanitary authorities concerned.

Where compulsory notification of measles is utilised, by prompt and systematic visitation, as a clue to the existence of unreported cases; where knowledge thus acquired is supplemented by information derived from school authorities and properly utilised; where, in inter-epidemic periods or during stages before epidemics have passed beyond control, measures are adopted with a view to isolation and disinfection; and where judicious restrictions are imposed on attendances at elementary and other schools, much more is to be looked for in the control of measles than has, heretofore, been attained; but, it cannot be too clearly understood that good result is not to be expected from the adoption of any single one of these several measures; and that if any approach to complete success be aimed at, each one of the several measures indicated must be regarded as necessary and supplementary to the others.

EPIDEMIC INFLUENZA.

For a sixth time, during a period commencing with the winter of 1889-90, Influenza assumed epidemic proportions in England in the early months of 1895; and it was deemed desirable by the Board that a memorandum should be issued embodying a statement of such measures of prevention as were practicable under the circumstances of this disease. Having regard to the extremely short incubation period of epidemic influenza, to the corresponding rapidity in the power for multiplication of attacks, as also to the fact that its infectious quality is often manifested before the disease is recognised, the prospect of success, in the application by the public of measures of prevention that could reasonably be imposed, was by no means great. A memorandum was, however, compiled containing certain information concerning the etiology of the disease, and suggesting certain measures of prevention. The memorandum is reproduced in Appendix A., No. 12.

RETURNS OF NOTIFIED INFECTIOUS DISEASES.

I append (A., Nos. 13 and 13A), as on the occasion of my two previous annual reports, a compilation of returns of notified cases of infectious diseases, together with the corresponding registered deaths from the several causes specified. The data are arranged, in the case of 81 sanitary areas of England and Wales, for each quarter of the year 1894; as also week by week throughout the year in the case of 42 similar areas comprised within the administrative county of London.

ENGLISH CHOLERA EXPERIENCE IN 1894.

3. ENGLISH CHOLERA EXPERIENCE IN 1894.

It is with great satisfaction that I am able to report that not a single death from Asiatic cholera occurred in this country in 1894. The view has commonly been held that when cholera has succeeded in making its way into this country in any one year there was every prospect of its recrudescence in epidemic proportions in the succeeding year; and this view had derived every confirmation from past experience. In this connexion I propose to make comparison as to this sequence of events between epidemics in which cholera, after traversing Russia and Northern Germany, has effected an entrance into English communities. In so doing I am, however, obliged to exclude that of 1831–32 because no mortality statistics are available for that period; and even as regards the epidemics of 1848–49, 1853–54, and that which has just passed by, namely 1893–94, I find it difficult to differentiate between them with accuracy by reason of the fact that the term "cholera" in the returns of the Registrar-General includes English cholera and affections other than the disease of Asiatic type. But, as regards the 1848–49 epidemic, we have the late Dr. Farr's authority for making a statistical distinction* between true cholera and other diarrhœal affections; and with regard to the last epidemic period we possess information which, from the point of view of diagnosis, is much more accurate than that issued by the Registrar-General under the general term "cholera." Subject to these considerations, I would set out the number of deaths attributed to cholera in the three sets of years in question, and in doing so I would only remark that any flaw which attaches to the comparison as a strict statistical study, by reason of the fact that the several sets of figures have not precisely the same significance, is altogether overwhelmed by the entire and complete reversal of previous experience in so far as the period 1893–94 is concerned.

——	Date.	Cholera Deaths.
1st period - - - -	1848 1849	1,105 53,293
2nd period - - - -	1853 1854	4,419 20,097
3rd period - - - -	1893 1894	135† 0

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* In the late Dr. William Farr's Report on the Mortality from Cholera in England 1848–49, he writes on page x, "1,934 deaths were referred to cholera; 829 in the first nine months and 1,105 in the last three months of the year 1848. The former were generally considered cases of common "English" cholera; many of the latter were universally held to be "Asiatic cholera."

† The figure 135 is taken from page ix of my report on Cholera in England during 1893. I have not regarded 1892 as the first year of invasion of this country during the present European epidemic for the purposes here under consideration, because in 1892 cholera was practically arrested at our ports, not a single person beyond those actually arriving from abroad having suffered from the disease. There was, indeed, no death from Asiatic cholera amongst the population of England during 1892.

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The exceptional experience of 1894 must be regarded with satisfaction both by the Board and by the country; for it has coincided with efforts on the part of the Board, by way of inspections and visits in connexion with the Cholera Survey, such as it was heretofore never practicable to put forth; and it has been brought about in sequence to the adoption, over a long series of years, of local sanitary measures, such as have never before had so powerful an influence in the removal of causes of preventable disease and death.

Monsieur Henri Monod, the distinguished Director of the Public Health Department of France, has shown, in his work on "Les Mesures Sanitaires en Angleterre depuis 1875 et Leurs "Résultats," that if we accept Dr. Farr's estimate of the value of human life—men, women, and children—at 159*l*. a head,* the saving of life in this country during the decennial period 1880-89, as judged by the diminution in the rate of mortality from all causes, gave a total of 876,581 lives which would otherwise have been lost, and that by this gain England more than recouped herself an annual expenditure in matters relating to public health at the rate of not less than eight millions sterling.† I will not attempt to appraise with accuracy what this country owes to the expenditure incurred in sanitary administration and sanitary measures during the period when we were exposed to the test of the late European cholera epidemic; but I have no hesitation in asserting that the exceptional expenditure incurred in this country during 1893-95, whether by the Central Government or by Local Authorities, was one which, even from the financial point of view, must be classed as reproductive.

In Appendix A., No. 14, I submit a brief report, by Dr. Barry, which gives some account of the circumstances attending certain cases of cholera, which were brought by ship into our sea ports during 1894. In no instance did extension of the disease take place to any person resident in the kingdom. The report also refers to a few non-fatal attacks of reputed cholera observed in England during the year.

The Cholera Survey, which was commenced in 1892, was continued throughout 1894. In the latter year 30 sanitary districts, port and riparian, were visited in reference to precautions along our coast line; and 162 inland sanitary districts were inspected as to their general sanitary administration, with especial relation to the danger that might be incurred as the result of any chance cholera brought into their midst. A memorandum as to this survey will be found in Appendix A., No. 15; but I propose to submit to you a complete report on the Inland Cholera Survey in a separate volume.

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* "The minimum value of the population of the United Kingdom—men, women, and children—is 159*l*. a head; that is the value inherent in them as a productive money earning race." Vital Statistics: William Farr, page 61; also Journal of the Statistical Society. Vol. XVI., pp. 38-44.

† For the source whence Mons. Monod takes this sum of eight millions, see Supplement by the Medical Officer to the Board's 15th Annual Report. Reports and Papers on Cholera, page 36 [C.—4873], 1886.

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II.—*CHOLERA PREVALENCES.*

CHOLERA IN EUROPEAN AND OTHER COUNTRIES.

In continuation of his reports on the diffusion of the cholera epidemic which entered Europe from the east in 1892, Dr. Barry has prepared an elaborate account of the movements of that disease during 1893. (Appendix A. No. 16.)

Cholera—(*a*) in the Ottoman Empire;

In the Ottoman Empire cholera manifested itself anew in Arabia as an extension of the 1892 epidemic in Yemen, and being carried to Mecca during the course of the exceptionally crowded pilgrimage of 1893, which acquired special sanctity because the day for the performance of the ceremonies at Mouna fell on a Friday, a vast and unknown mortality ensued. The official records give 7,935 deaths at Mecca and Mouna in the six weeks ending July 19th; but the chief Shereef of Mecca estimated the mortality at 50,000; and it is known that in 22 days there were 4,531 cholera deaths at Jeddah alone. The return of the pilgrims to their several homes led to the diffusion of the disease in Asia Minor and in Constantinople, where 1,160 cholera deaths took place in the period August 20th, 1893–January 6th, 1894; the immediate cause of the diffusion of the infection in the Turkish capital being contamination of a portion of the public water supply of the city. In Mesopotamia, into which cholera was probably imported from Persia, 4,320 deaths were officially notified.

(*b*) in Persia;

Certain prevalences of cholera in Persia during 1893 were apparently in continuation of the 1892 epidemic in that country, but later a fresh importation took place from Mesopotamia, and the disease re-invaded the south-western provinces, and spread to Teheran, where at one time a daily average of 60 deaths occurred. No reliable statistics are available, but as the result of his study of cholera in Persia, Dr. Barry accepts an estimate of 150,000 cholera deaths in Persia during 1892–93, and inclines to the view that some 70,000 of these must have occurred in 1893.

(*c*) in Russia;

In Russia cholera had all but subsided during the winter of 1892–3, but with the advent of warm weather in June and July 1893 the disease again assumed an epidemic form. During August and September it spread throughout the empire, and became especially prevalent in a number of border-land provinces, as also in St. Petersburg. Dr. Barry gives a detailed tabulation of the statistics of this epidemic prevalence, and he notes some striking instances to show how certain sudden explosions of the disease had their origin in the consumption of specifically polluted water. The total number of cholera attacks in European Russia during 1893 was 99,550; and of these 41,047, or 41·3 per cent., proved fatal.

(*d*.) in France.

In the absence, thus far, of any official report on the prevalence of cholera in France during 1893,* the account of cholera in that country during that year has had to be compiled from various sources including certain authoritative statistical publications. Cholera was still lingering in portions of north-west France, and notably in Morbihan, early in 1893, and in the latter province no less than 476 attacks and 178 deaths were recorded as having taken place in 27 communes, between March 8th and April 9th, after which date the epidemic declined. In the meantime the disease had appeared in Marseilles during the month of February, and at Toulon and Nîmes in March. After this latter date a somewhat wide extension of cholera took place, notably in departments on the Italian frontier and on the Mediterranean, as also in the west from Finistère into departments bounded by the Bay of Biscay. Other departments were subsequently affected, but with the exception of the city of Marseilles, and perhaps also the towns of Nantes and Brest and Alais, no considerable outbreak took place. In all, 40 departments were seats of cholera in 1893, some 3,000 deaths assigned to cholera or allied disease having been recorded.

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* Whilst this report is passing though the press a detailed report on cholera in and about Alais has been received. It is entitled, "Choléra. Epidémie à Alais "et aux Environs en 1893. Rapport présenté par M. le Dr. Ernest Mosny. "Recueil des Travaux du Comité Consultatif d'hygiène publique de France. Tome xxiv, 1894.

Amongst other details recorded Dr. Barry gives an account of a somewhat sudden and severe outbreak at Barrême, in the Basses Alpes, due to specifically contaminated drinking water.

Perhaps one of the most important matters concected with the prevalence of cholera in France during 1893 is concerned with the occurrence at Marseilles, where, according to official statistical records, no less than 861 deaths were recorded as due to "choléra et maladies cholériformes." After the occurrence in February of 102 such deaths, there was a complete absence of fatal attacks in March, and only 16 deaths took place in the two months April and May. This was followed by a rapid increase in June, when 164 fatal attacks occurred, and the epidemic reached its height in July, during which month no less than 437 deaths were recorded. In August the deaths under the heading referred to fell to 124, after which the outbreak rapidly abated. As will be seen from Dr. Barry's Report, a declaration was made at a meeting of the Comité Consultatif d'Hygiène de France, held on July 3rd, to the effect that no epidemic "foyer" existed in Marseilles at that date; and, according to a despatch from Her Majesty's Consul of August 12th, this declaration was at that date still embodied in bills of health issued at Marseilles. In my last annual report * I dealt with this question of a cholera "foyer" at some length, because under the Dresden Convention which was drawn up in April 1893, it had been decided that the notification of cholera between countries was to be limited to the existence of an actual "foyer." But it must be remembered that the ratifications of the Dresden Convention were not deposited until February 1st, 1894. The clauses dealing with international notification of cholera in that instrument contain, however, a significant indication as to the interpretation to be henceforward placed upon the term "foyer," by reason of the explanatory

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* Supplement for 1893-4, by the Medical Officer, to the 23rd Annual Report of the Local Government Board. [C.—7538] 1894, p. 450.

paragraph: "Isolated cases do not necessarily form the subject "of a notification."

(e) in Italy.

After an almost complete exemption from cholera in 1892, Italy suffered somewhat extensively in 1893; the disease appearing anew on more than one occasion in provinces near the French and Austro-Hungarian frontiers, at dates when cholera prevalences were occurring in both those countries, and when Italian workmen were in consequence returning to their homes. Amongst other cities affected was Naples, to which the disease was brought by sea; but although cholera was imported into this densely crowded community, and caused some substantial mortality, it never acquired in 1893 that virulent power for spread which had marked so many former occurrences of the disease in that city. Indeed, the cholera history of Naples since the city was provided with a new water supply in 1885 affords a striking instance of the immense influence of a wholesome water service in relation to the spread of cholera. Between 1836 and 1884 Naples had suffered nine cholera epidemics; the 1884 epidemic causing 15,927 attacks and 7,994 deaths. Since 1885 the city has had practical immunity from the disease, until 1893, when its introduction into a military port, with consequent pollution of the waters of that port by cholera sewage, led to the occurrence described by Dr. Barry. Naples, however, served in 1893 as a centre whence the disease spread along lines of human intercourse to a number of neighbouring communes; thus, there were no less than 625 attacks and 283 deaths in 34 communes comprised within the province of Campobasso. Palermo also suffered somewhat severely between the middle of August and the first week of December, the attacks and deaths numbering respectively 1,140 and 548. Rome was even more successful than Naples in preventing any epidemic diffusion of the disease during 1893. Dr Barry describes the course of the Italian cholera prevalence at some length, and he shows that in all 5,731 cases and 3,036 deaths were recorded as having taken place in 29 provinces.

(f) in Germany.

The principal interest in connexion with the prevalence of cholera in Germany during 1893 centres in a sudden outbreak which took place in Hamburg. Certain suspicious diarrhœal occurrences associated with attacks of true cholera took place there in May and June, especially amongst dock hands who procured their water from a point on the south bank of the Elbe near the outfall of a drain. Other sporadic cases took place later on, the incidence of the disease being most marked on the floating population of this great port. But in September a sudden accession of attacks took place; no less than 179 persons were attacked between September 10th and October 14th, and of these 95 sickened in the seven days ending September 23rd. Before this occurrence it had been ascertained that an increase had taken place in the number of micro-organisms in the new, filtered, water supply, a circumstance which could only be explained by accidental fouling of the service, and immediately preceding the sudden outburst referred to, the officials found that owing to a settlement of some masonry connected with a conduit conveying the water from the filter beds to the pumping station, unfiltered Elbe water had got access to the supply. The only sanitary circumstance common to those who were attacked in widely different parts of the city was community of water service; and it is worthy of record that, just as occurred several times during the now historic Hamburg-Altona cholera prevalence of 1892, the opportunity for pollution of the water service was in the first instance promptly followed by cholera, and after a further interval by a very large increase in the notifications of enteric fever; this sequence of events corresponding with the short incubation period of the first and the longer incubation period of the second disease. Apart from this occurrence at Hamburg, cholera appeared in over 100 places in Germany, and caused in all 567 attacks with 298 deaths, a considerable proportion of these taking place along the lines of the great navigable rivers; others, again, were due to importation over the frontiers. In several instances, notably as regards the Elbe at Hamburg, the Havel, the Oder, and Stettin Harbour bacteriological examination of the water led to the discovery of Koch's comma bacilli, and the occurrences of cholera in connexion with the use of these waters, and of others which had had opportunity for specific infection, are amongst the most interesting in Dr. Barry's account of cholera in Germany. On the other hand, it is on record that comma bacilli were discovered in the intestinal discharges of a number of persons who, though they had had some relation with cholera patients, were both at the time and subsequently in apparently perfect health.

(*g*) in Austro-Hungary;

As regards Hungary, the 1892 epidemic extended into February of the following year in the city of Budapest, but it was not until June 1893 that new importations of the disease led to a wider prevalence, which ultimately affected 634 communes, situated in 53 out of a total of 63 counties, and led to 6,753 attacks, with 3,773 deaths. Up to the end of July all the counties invaded by cholera were in the north-east, near the Galician frontier, and its later extension was, at least in part, attributable to panic-stricken and fugitive workmen, who had been engaged in constructing a railway from the frontier county of Marmaros into Galicia. No complete account of cholera in Austria during 1893 has as yet been published, but it is known that subsequent to certain recrudescences of cholera early in that year, East and South-Eastern Galicia became invaded during the month of August by navvies and other workmen returning from the infected county of Marmaros; and that the disease did not die out until the close of the year, when 36 Galician departments had been affected. There were also a few attacks of cholera in Bukowina and in the city of Vienna. In all, 160 Austrian towns and villages were invaded by cholera in 1893, the number of attacks being 1,473 and the deaths 865. In Bosnia, eight departments in the government of Tuzla were affected, the disease spreading with rapidity amongst some of the Mohammedan population. The frontier town of Brcka was first affected, as the result, it is believed, of the influx of workmen returning from North Hungary. The measures taken to prevent and to control the spread of cholera in different parts of Austro-Hungary are set out by Dr. Barry in some detail, and they derive interest from the fact that they were mainly based on the principles embodied in the Dresden Convention of 1893, and that they were in large measure successful.

(h) in Belgium;

A few isolated occurrences of cholera took place in Belgium in the early summer months of 1893, but during August, September, and October it spread rapidly, affecting a number of provinces including Flandre Orientale, Hainaut, Anvers, and Brabant; but it became extinct in the month of November.

(i) in the Netherlands;

In the Netherlands there was a wide-spread diffusion of the disease, no less than 100 communes being invaded; but the disease was largely of a sporadic character, and it nowhere became epidemic. The total cholera deaths recorded during 1893 amounted to 263.

(j) in Roumania;

In Roumania there were 1,494 attacks of cholera, with 872 deaths, in 1893, the more important places attacked being the ports of Braila and Sulina and Galatz. In both of the former the disease was attributed to the use of unfiltered Danube water, and in Sulina the outbreak was of that explosive character which is so commonly associated with the use of a specifically contaminated water supply. In Galatz, where the incidence was less marked, the Danube water, which is delivered to the population, is filtered.

(k) in Spain;

In only three provinces of Spain was there any spread of cholera in 1893, namely, those of Viscaya, Zaragoza, and Guipúzcoa; the total recorded attacks and deaths being 1,149 and 490 respectively. As yet no complete official account has been received of the Spanish outbreak, but its earliest definite manifestation was in and near the port town of Bilbao, the capital of Viscaya; and it was only in this province that anything approaching to an epidemic occurred.

(l) and in other countries.

Dr. Barry makes his record of the Western Diffusion of Cholera during 1893 complete by giving a brief summary of the already published account of the disease in England and Wales, and by supplying such information as is available with regard to cholera in Algeria, Tunis, Tripoli, Morocco, the Canary Islands, the United States, and Egypt, and he illustrates it by a large amount of carefully tabulated statistical matter, as also by a series of maps, many of which show the distribution of the disease in the countries concerned, both topographically and according to date. During the course of the report he also gives a number of interesting details as to special outbreaks of the disease; and reviewing both these and the whole story of the western spread of cholera during the period 1891–93, he submits that the facts

Medical Officer's Report.

recorded justify four definite conclusions. In this view I entirely concur, and, having regard to their significance, I reproduce them here. They are as follows :—

1st. This diffusion of cholera from one place or country to another, has invariably followed lines of human intercourse.

2nd. Increased facilities for steam communication by land and by water, especially between Central Asia and Europe, have conduced to a rapidity in the diffusion of cholera hitherto unprecedented.

3rd. Cholera, in its progress by way of river traffic, has fastened on more centres of population than when its diffusion has taken place over-land.

4th. All "explosions" of cholera, as to which detailed evidence has been forthcoming, have been found, on investigation, to have been referable to specifically polluted water supplies.

AUXILIARY SCIENTIFIC INVESTIGATIONS.

Etiology of Enteric Fever.

In further study of the etiology of enteric fever Dr. Klein has addressed himself to certain interesting and probably important considerations that are involved in the life history of the typhoid bacillus. In the first instance, and in view of the ability (demonstrated by him last year) of this microbe to multiply in the lymph glands of the calf, Dr. Klein has sought to ascertain whether its life processes within the body of this animal lend themselves to the production of an anti-toxic serum that will protect against enteric fever. And, secondly, he has made test of the ability of the bacillus, outside the animal body, to thrive in sewage matters wherewith it commonly becomes mingled, and in drinking water to which it may obtain access.

For the purpose of obtaining from the calf, blood-serum of the above sort Dr. Klein subjected this animal (App. B., No. 1) to repeated subcutaneous injection, in gradually increasing doses, of living culture of the typhoid bacillus. These injections, administered at intervals of three to four weeks, were always followed by diffuse swelling at the seat of inoculation, accompanied generally by transient rise of temperature, but by no other definite symptoms. From a calf thus dealt with, blood was withdrawn at several different stages of the "preparatory" process, and serum separated from this blood was injected into guinea-pigs just before, or at the same time that, they were also injected with an ordinarily fatal dose of living culture of the typhoid bacillus. The blood-serum was administered sometimes subcutaneously, sometimes into the peritoneum, and the quantity injected ranged from one-eighth to one-half a cubic centimetre: The poisonous dose of typhoid bacilli was injected in each instance into the peritoneum. As a result, this calf serum was found to exert within the body of the guinea-pig decided germicidal action on the typhoid bacillus. Thus, in the 16th week of "preparation" of the calf, a quarter of a cubic centimetre of its serum sufficed to inhibit an ordinarily fatal dose of agar culture of the typhoid bacillus simultaneously injected with it into the peritoneal cavities of certain guinea-pigs, and at a later stage of experiment subcutaneous injection of half a cubic centimetre of the serum served to protect this rodent against injection per peritoneum half an hour afterwards of a virulent dose of culture of this microbe. So far as they have gone, then, these investigations of Dr. Klein are such as to encourage hope of means of prophylaxis as regards enteric fever.

Dr. Klein's other work in connexion with enteric fever during the year, namely, his observation of the behaviour of the typhoid bacillus outside the animal body, is of particular interest to the student of the natural history of this disease. Be it remembered that representations have from time to time been made as to the inability of this microbe to multiply, or even to maintain for many days its existence, in samples of raw sewage and of drinking water to which it has been added, and that laboratory facts of this class have been cited as casting doubt on the water-causation of certain wide-spread epidemics of enteric fever in regard of which circumstantial evidence of incontrovertible sort had intimately associated dissemination of the fever with the distribution of particular water services. Why failure in the laboratory of the typhoid bacillus to satisfy conditions (multiplication, for instance, of it outside the animal body in water media) that must needs be fulfilled by the particulate cause of enteric fever, should be adduced as calling in question some of the best ascertained facts of etiology does not, indeed, appear. By a parity of reasoning, there is as good ground for regarding these laboratory observations as discounting belief in the "typhoid bacillus" as the essential cause of enteric fever—even better ground, perhaps, since this microbe has not yet been proved experimentally capable of inducing a disease that is unequivocally of the nature of enteric fever. But, however this may be, Dr. Klein is able to show that belief in the inability of the typhoid bacillus to thrive in sewage and in drinking water has no sufficient basis in fact. He demonstrates (App. B., No. 2) that certain conditions to which sewage is very probably often subject in the course of its disposal on or through land can be without difficulty imitated in the laboratory, and with the result that the typhoid bacillus readily multiplies in sewage thus dealt with; while, as regards drinking water (App. B., No. 3) he shows not only that in many different waters this bacillus may persist longer than has hitherto been demonstrated, but also that in certain of them which are to be thought of as especially affording pabulum for the microbe, the typhoid bacillus is able on occasion to proliferate in abundant fashion. These observations of Dr. Klein are the more interesting and instructive since, alike in his sewage and in his water experiments, he contrasts always the behaviour of the typhoid bacillus with that of Koch's cholera vibrio, and adds also corresponding data respecting that almost ubiquitous micro-organism, bacillus coli.

PROTECTIVE INOCULATIONS.

In continuance of his study of protective inoculations against one and another specific disease Dr. Klein has given further attention to procedures which rely solely upon injection of the actual microbe of the particular malady as a means to this end. In view of the fact, which he has again and again insisted on, that the specificity of different living microbic agents of infection depends sometimes upon the chemical material contained in the intra-cellular substance of the microbe, sometimes on the deleterious products of its life processes within the animal body, Dr. Klein has been at pains to distinguish always between "protoplasm' and "product' as regards the several infecting microbes that he has made subjects of study. These have comprised, in 1894–95 (App. B., No. 4), Koch's cholera vibrio and the vibrio of Finkler, each of which was tested by Dr. Klein in the above sense by injection into the peritoneal cavities of guinea-pigs. As a result he found that the intra-cellular substance—protoplasm—of neither of them had any effect in protecting this animal against subsequent intra-peritoneal injection of the pure toxin—metabolic product—of the microbe of experiment. Only when he made use for his injections of living culture of the one and the other vibrio, did he find his experimental guinea-pigs rendered resistant to the corresponding toxin. Wherefore he infers, as regards cholera, that no method of prophylaxis based on inoculation of Koch's vibrio is likely to prove of service unless this vibrio be injected in an actually living state, and under conditions therefore enabling it to elaborate from the tissues of the person in whom it is implanted those specific toxins upon which its specificity would seem to depend.

The observations and inferences of Dr. Klein are of particular interest in their bearing on the protective inoculations practised by M. Haffkine in India. In so far as M. Haffkine's method involves injection into the human subject of living culture of Koch's comma bacillus, it would seem on *a priori* grounds to promise for the persons inoculated some measure of resistance to the infection of cholera. The degree, however, of such resistance, as well as its lasting quality, must needs call for strict future scrutiny.

PROPHYLAXIS IN DIPHTHERIA.

In view of the above and of previous observations of his respecting the different values of protective inoculations according as the protoplasm or the metabolic products of a microbe are employed for this purpose, it occurred to Dr. Klein to test the prophylactic—in contrast with the therapeutic—potency of certain anti-toxic serums that were being imported to this country to be made use of as curative agents in diphtheria of the human subject. These anti-toxic serums of foreign origin, are, as is well known, obtained from the blood of horses which have been during a period of two or three months repeatedly injected, *not* with the living material of diphtheria but with the toxins elaborated by the diphtheria microbe in artificial culture media. As a result of his tests Dr. Klein found, as indeed he had anticipated, that for arresting in the guinea-pig the operation of a fatal dose of the living diphtheria bacillus a much larger quantity of "curative" serum was required than sufficed to neutralise a fatal dose of the pure toxin of this microbe; a quantity, in fact, that would, if "protection" of the human subject were in question, militate against the use of these serums for this purpose. Accordingly he obtained the Board's assent to experiments on the horse, with a view to the production, if possible, of serum more potent in prophylaxis against diphtheria than that he had been testing; his purpose being to subject the horse to repeated injection with living cultures of diphtheria bacillus instead of injection of pure diphtheria toxin.

To this end Dr. Klein procured (App. B., No. 5) a pony, and repeatedly injected it, subcutaneously in the neck, with gelatine, agar, and broth cultures of the diphtheria bacillus. For some of his earliest injections he employed, wholly or in part, sterilised cultures, *i.e.*, dead protoplasm of the diphtheria microbe; but soon he used, in increasing amount, the living bacillus. His procedures in regard of this pony extended over some 150 days, and comprised 20 separate injections of the animal, the interval between the injections being governed by the time occupied by the pony in recovering from the effects—swelling at the seat of inoculation and rise of body temperature—of the dose previously administered. These effects were on the whole less pronounced in the later than the earlier stages of operations, though the pony never ceased to re-act in the sense above indicated.

At a very early stage of the experiment, namely, on the 27th day from its commencement, the blood-serum obtained from this pony possessed very decided germicidal action on the diphtheria bacillus when injected along with this microbe into the subcutaneous tissue of guinea-pigs, one-tenth of a cubic centimetre of it sufficing to completely inhibit the effects of an ordinarily fatal dose of living culture. In this respect his serum appeared of equal potency with anti-toxic serum obtained from the Continent which had required two or three months for its preparation, and the result was to a corresponding extent encouraging to Dr. Klein. The next sample of the pony's serum, taken on the 42nd day of experiment, was even more promising, since it was found to possess double the potency of that obtained on the 27th day. But this progressive increase of potency of the pony's blood-serum was not maintained on further injection of the animal. Twenty days later the serum was found somewhat less potent than when first tested, and, notwithstanding additional repeated injection of the pony in considerable amount with virulent cultures of the diphtheria bacillus, its serum remained thereafter of much the same strength as at first. The reason for this, as well as for the diverse reaction of different specimens of the equine animal to injection of the diphtheria bacillus, is being made the subject of further study by Dr. Klein.

"INFLUENZA COLD."

Early in 1893, when epidemic influenza began to manifest itself again for a fourth year in this country, I drew the attention of the Board to the desirability of investigating the pathological and bacteriological relations of that disease to the common "household" or "influenza" cold. For at least 700 years epidemic influenza has recurred in different parts of the world; and, to quote Hirsch, it has from time to time manifested itself "over a great part of the globe as a true pandemic." The manner of its spread was formerly deemed to be "subtle and occult"; but it had long been recognised that some generally prevailing "influence" was at work, and hence the disease was written and spoken of under the terms "influentia" in Low Latin or "influenza" in Italian.

In many important clinical respects epidemic influenza and influenza cold exhibit striking similarities. Both are highly infectious from person to person, both have extremely short periods of incubation, and, perhaps above all, both are associated with a condition of mental and "nerve" prostration which is altogether in excess of the objective symptoms, and especially of the catarrh. Considerations of this sort raise the question whether that which we term our ordinary household or influenza cold may not be a "resting," an inter-epidemic, form of a disease which at uncertain intervals, and under unknown conditions, acquires a special virulence and power for spread. Such variations are known to be not uncommon in the case of zymotic diseases which are spread through the agency of specific micro-organisms.

It was in view of these circumstances, and in continuation of the former reports submitted to the Board on epidemic influenza,* that, in 1893, Dr. Cautley was instructed to inquire whether the ordinary infectious "cold" was associated with any definite microbe, and, if so, what were the relations, if any, of that organism to the micro-organism of influenza. Considerable difficulties were met with in finding suitable cases and material for this investigation; for it was, above all, important to eliminate attacks that might be mild manifestations of the epidemic disease. The result was that only ten cases of catarrh came under investigation; in most of these the nasal secretion had already reached the muco-purulent stage; and from a bacteriological point of view the inquiry, which was reported on in my Annual Report for 1893–94, was essentially negative in its outcome.

Dr. Cautley, continuing during 1894–95 his investigation of this subject (App. B., No. 6), has obtained different and more encouraging results. In seven out of eight cases of feverish

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* (1.) Report on the Influenza Epidemic of 1889–90 (C.—6387), 1891. (2.) Further Report and Papers on Epidemic Influenza, 1889–92 (C.—7051) 1893.

catarrh designated "influenza cold," occurring in London after subsidence of an epidemic of influenza, he obtained from the nasal secretion microbes much resembling the influenza bacillus, though differing therefrom in certain biological and microscopical features. One such microbe, which Dr. Cautley terms *bacillus coryzæ segmentosus*, was the predominant, or at least a very abundant, organism in the nasal secretion of six of his cases; another, to which he gives the name *pseudo-influenza bacillus*, though less abundantly present, occurred in four out of the seven cases in which microbes having resemblance to the influenza bacillus were detected. If, as Dr. Cautley infers, the bacilli in question are to be regarded as causing the ordinary "influenza cold," there would appear ground for the further inference that colds of this class are etiologically closely allied to true influenza; and as well for the suspicion that the influenza bacillus itself is not morphologically, culturally, or pathogenically a particularly stable microbe.

BACTERIOLOGY OF FOOD.

In view of outbreaks of "food poisoning" from time to time investigated by the Medical Department, and which have been referred to the presence in the implicated food of particular bacteria or of the deleterious products of their life-processes, study has been undertaken of the bacterial condition of different foods in the every-day circumstances under which they are retailed by the tradesman. Dr. Cautley, to whom inquiry in this sense was entrusted, has (App. B., No. 7) subjected to strict bacteriological scrutiny a number of articles of food of kinds heretofore convicted of having caused gastro-enteric illness in man. So far he has not discovered in any sample of food submitted to his tests bacteria of recognised pathogenicity for the human subject, nor, indeed, any microbes having injurious effect upon rodents when administered to certain of these animals by way of the alimentary tract or by means of subcutaneous injection.

PNEUMOCOCCUS.

The bacterium known as the diplococcus of Fraenkel and Weichselbaum has a wide distribution in the animal body. Not only has it been discovered abounding at times in the tissues of pneumonia (whence its other name "pneumococcus"), but also it has been again and again found in association with a variety of lesions in the human subject in a way to suggest its concern in a diversity of disease processes. The natural history, therefore, of this microbe possesses exceptional interest, and accordingly it has been made subject of study by Dr. Kanthack. In Appendix B., No. 8, Dr. Kanthack gives in considerable detail an account of the pneumococcus, and of his own observation and testing of the microbe under a great variety of conditions. As the outcome of his scrutiny of all the facts that have come before him he is indisposed to accept this diplococcus as the essential cause of any one of the maladies with which it has seemed to be concerned: rather he inclines to the inference that the diverse disease manifestations which in the human subject are found associated with pneumococcus are governed, under different conditions, now by one now by another factor to which this diplococcus is in each instance subordinate.

The Chemical Pathology of Tetanus.

From my report for the year 1892–93 it will be seen that Dr. Sidney Martin had extended his investigation of the chemical pathology of infectious diseases to tetanus, but that he reserved dealing with that subject until his next report. A preliminary report thereon was published in my volume for the year 1893–94, but Dr. Martin reserved the examination and separation of the toxic substances produced by the bacillus of tetanus in artificial culture for a future report. A further report on this subject for the year ending March 31st, 1895, is now appended (App. B., No. 9).

I have the honour to be,
Sir,
Your obedient Servant,
R. THORNE THORNE.

April 1896.

APPENDICES.

App. A. No. 1.

Digest of Vaccination Officers' Returns, 1892.

APPENDIX A.

No. 1.

Digest of the Vaccination Officers' Returns (made up to the 31st January 1894), with regard to Children whose Births were registered in the Year 1892.

The following is the twenty-first annual return under the Vaccination Act, 1871. Of 890,695 births returned to the Board by the several Vaccination Officers in England and Wales, as registered during the year 1892, the number which by the 31st January 1894 had been registered as successfully vaccinated was 663,657 (being 74·5 per cent. of the whole), and the number registered as having died unvaccinated was 92,490 (or 10·4 per cent. of the whole). Of the remaining 134,548 children, 1,983 (or 0·2 per cent. of the whole) had been registered as insusceptible of vaccination; 26 (or 0·003 per cent.) as having contracted small-pox before they could be vaccinated; 13,278 (or 1·5 per cent.) as having their vaccination postponed by medical certificate; leaving 119,261 (or 13·4 per cent.) as "removed," "not to be traced," or otherwise unaccounted for. If from the 890,695 births returned by these officers deduction be first made of the deaths that took place before vaccination, it appears that of the surviving 798,205 children, there were registered at the time of the return 83·1 per cent. as successfully vaccinated; 0·3 per cent. as either insusceptible of vaccination, or as having had small-pox; and 1·7 per cent. as under medical certificate of postponement; leaving 14·9 per cent. as at that time still unaccounted for as regards vaccination.

The proportion of cases unaccounted for in the metropolitan returns for 1892 is 18·4 per cent.; in the provincial returns, 14·3. Of the registered births of the twenty-one years 1872–92, the proportion not

APP. A. No 1.

Digest of Vaccination Officers' Returns, 1892.

finally accounted for in regard to vaccination in each year respectively has been as follows:—

—	Metropolis.	Rest of England.	—	Metropolis.	Rest of England.
1872	8·8	4·5	1883	6·5	4·9
1873	8·7	4·2	1884	6·8	5·3
1874	8·8	4·1	1885	7·0	5·5
1875	9·3	5·8	1886	7·8	6·1
1876	6·5	4·0	1887	9·0	6·7
1877	7·1	4·1	1888	10·3	8·2
1878	7·1	4·3	1889	11·6	9·6
1879	7·8	4·5	1890	13·9	10·9
1880	7·0	4·5	1891	16·4	12·9
1881	5·7	4·3	1892	18·4	14·3
1882	6·6	4·5			

In 1892 the proportion of cases unaccounted for, after deduction of the postponed cases, in the Metropolis and in the Rest of England, was 16·9 and 12·8 per cent. respectively.

App. A. No. 1.

Digest of Vaccination Officers' Returns, 1892.

—	Returns, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed) per cent. of births.
ENGLAND & WALES -	890,695	663,657	1,983	26	92,490	13,278	119,261	14·9
Ditto (excluding Metropolitan Unions).	758,358	568,964	1,555	20	79,574	11,409	96,836	14·3
METROPOLITAN UNIONS -	132,337	94,693	428	6	12,916	1,869	22,425	18·4
COUNTIES.								
ENGLAND:								
Bedford - - -	4,450	1,710	5	—	486	53	2,196	50·5
Berks - - -	7,201	5,939	6	—	614	154	488	8·9
Bucks - - -	4,759	3,877	6	—	422	47	407	9·5
Cambridge - -	5,279	4,478	11	—	496	128	166	5·6
Chester - - -	21,426	17,944	34	—	2,223	317	908	5·7
Cornwall - - -	8,572	6,175	17	—	936	132	1,312	16·8
Cumberland - -	8,252	6,655	7	—	771	217	602	9·9
Derby - - -	14,529	10,243	23	—	1,632	160	2,471	18·1
Devon - - -	16,604	13,882	29	—	1,432	270	991	7·6
Dorset - - -	4,852	3,875	6	—	397	69	505	11·8
Durham - - -	38,352	30,106	65	—	4,218	535	3,428	10·3
Essex - - -	24,988	18,561	90	1	2,306	524	3,506	16·1
Gloucester - -	15,258	10,106	28	—	1,507	311	3,306	23·7
Hereford - - -	2,894	2,461	2	—	239	58	134	6·6
Herts - - -	6,924	5,477	14	1	524	77	831	13·1
Huntingdon - -	1,306	1,139	—	—	125	10	32	3·2
Kent (extra-metrop.) -	22,567	18,108	51	2	2,057	324	2,025	10·4
Lancaster - -	130,783	95,766	303	1	15,244	1,931	7,538	14·9
Leicester - - -	12,199	2,431	2	—	1,756	34	7,976	65·7
Lincoln - - -	13,126	10,208	42	—	1,390	321	1,165	11·3
Middlesex (ex.-metrop.)	16,286	12,664	85	—	1,369	201	1,967	13·3
Monmouth - -	10,046	8,178	9	—	940	286	633	9·1
Norfolk - - -	12,833	8,473	11	—	1,429	166	2,754	22·8
Northampton - -	9,488	3,164	3	—	1,073	83	5,165	55·3
Northumberland -	17,180	13,567	35	—	1,927	415	1,236	9·6
Nottingham - -	16,697	12,326	32	—	1,897	283	2,159	14·6
Oxford - - -	5,062	3,778	18	—	425	54	787	16·6

App. A. No. 1.

Digest of Vaccination Officers' Returns, 1892.

—	Returns, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
COUNTIES—*cont.*								
ENGLAND—*cont.*								
Rutland - - -	540	494	2	—	28	4	12	3·0
Salop - - -	6,777	5,758	12	—	575	89	343	6·4
Somerset - -	13,953	10,366	23	—	1,252	376	1,936	16·6
Southampton - -	18,925	15,923	49	—	1,593	251	1,109	7·2
Stafford - - -	33,992	25,540	61	5	3,968	626	3,792	13·0
Suffolk - - -	9,880	8,092	18	—	839	183	728	9·2
Surrey (extra-metrop.) -	14,960	11,647	43	—	1,257	355	1,658	13·5
Sussex - - -	5,369	4,421	8	—	428	79	433	9·5
Warwick - - -	25,459	18,191	57	3	2,837	256	4,115	17·2
Westmorland - -	1,683	1,504	1	—	119	14	47	3·6
Wilts - - -	6,925	5,432	9	—	558	226	700	13·4
Worcester - -	18,489	14,972	36	1	1,914	231	1,335	8·5
York, East Riding -	12,764	10,366	39	—	1,420	122	817	7·4
York, North Riding -	10,640	8,645	17	2	1,152	135	689	7·7
York, West Riding -	76,634	54,558	189	4	8,026	705	12,552	17·3
WALES:								
Anglesey - - -	849	752	—	—	67	2	28	3·5
Brecknock - -	1,528	1,280	—	—	148	40	60	6·5
Cardigan - - -	1,575	1,349	1	—	143	32	50	5·2
Carmarthen - -	4,175	3,562	1	—	382	31	199	5·5
Carnarvon - -	3,066	2,486	8	—	314	36	222	8·4
Denbigh - - -	2,799	2,423	4	—	271	38	63	3·6
Flint - - -	2,365	2,012	1	—	235	45	72	4·9
Glamorgan - -	27,035	22,318	39	—	3,041	253	904	4·3
Merioneth - -	1,644	1,416	2	—	156	41	29	4·3
Montgomery - -	1,671	1,461	—	—	133	30	47	4·6
Pembroke - -	2,298	1,931	1	—	219	48	99	6·4
Radnor - - -	428	274	—	—	44	1	109	25·7

App. A. No. 1

Digest of Vaccination Officers' Returns, 1892.

METROPOLITAN UNIONS.	RETURNS, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
Bethnal Green - -	4,947	1,681	1	—	636	79	2,550	53·1
Camberwell - - -	7,521	5,603	13	—	741	306	858	15·5
Chelsea - - -	2,802	2,179	5	—	280	18	320	12·1
Fulham - - -	6,447	5,381	28	—	617	57	364	6·5
George, St., Hanover Sq. -	2,912	2,508	31	—	275	13	85	3·4
George, St., in the East -	1,887	1,500	1	—	208	15	163	9·4
Giles, St., and St. George -	1,145	811	2	—	125	8	199	18·1
Greenwich - - -	5,441	4,335	30	2	543	73	458	9·8
Hackney - - -	6,807	2,939	21	—	476	50	3,321	49·5
Hampstead - - -	1,473	1,249	14	—	108	11	91	6·9
Holborn - - -	4,991	3,716	7	—	557	48	663	14·2
Islington - - -	9,626	7,221	28	—	1,182	127	1,068	12·4
Kensington - - -	3,728	3,001	13	1	330	52	331	10·3
Lambeth - - -	9,282	6,483	36	—	944	130	1,689	19·6
Lewisham - - -	2,423	2,058	10	—	196	17	142	6·6
London, City of - -	674	536	7	—	68	6	57	9·3
Marylebone - - -	4,387	3,273	4	—	367	—	743	16·9
Mile End Old Town -	4,049	1,352	7	—	310	—	2,380	58·8
Olave, St. - - -	4,974	3,642	8	1	539	136	648	15·8
Paddington - - -	2,957	2,374	7	—	202	16	358	12·6
Pancras, St. - -	7,189	5,415	31	1	616	184	942	15·7
Poplar - - -	5,898	3,934	27	—	547	26	1,364	23·6
Saviour, St. - -	7,128	5,334	15	—	842	77	830	12·7
Shoreditch - - -	4,511	3,516	8	—	408	46	443	10·8
Stepney - - -	1,940	1,269	2	—	228	16	425	22·2
Strand - - -	519	386	—	—	53	12	68	15·4
Wandsworth and Clapham	9,248	6,692	50	—	772	285	1,449	18·7
Westminster - -	836	559	2	1	82	22	170	23·0
Whitechapel - -	3,084	2,693	11	—	245	10	125	4·4
Woolwich - - -	3,511	3,023	9	—	329	29	121	4·3
	132,337	94,693	428	6	12,916	1,869	22,425	18·4

App. A. No. 1.

Digest of Vaccination Officers' Returns, 1892.

—	Returns, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
BEDFORD.								
Ampthill - - -	363	310	—	—	29	1	23	6·6
Bedford - - -	1,298	718	3	—	145	41	391	33·3
Biggleswade - - -	771	359	—	—	94	1	317	41·2
Leighton Buzzard - -	513	99	—	—	56	—	358	69·8
Luton - - -	1,290	64	2	—	143	9	1,072	83·8
Woburn - - -	215	160	—	—	19	1	35	16·7
	4,450	1,710	5	—	486	53	2,196	50·5
BERKS.								
Abingdon - - -	541	480	—	—	48	1	12	2·4
Bradfield - - -	476	436	—	—	20	2	18	4·2
Cookham - - -	563	451	—	—	48	16	48	11·4
Easthampstead - -	370	340	—	—	20	—	10	2·7
Faringdon - - -	310	243	—	—	28	16	23	12·6
Hungerford - - -	414	391	—	—	17	4	2	1·4
Newbury - - -	562	463	—	—	61	21	17	6·8
Reading - - -	1,836	1,314	2	—	208	72	240	17·0
Wallingford - - -	351	306	2	—	30	7	6	3·7
Wantage - - -	460	400	1	—	43	6	10	3·5
Windsor - - -	870	735	—	—	57	9	69	9·0
Wokingham - - -	448	380	1	—	34	—	33	7·4
	7,201	5,039	6	—	614	154	488	8·9
BUCKS.								
Amersham - - -	635	543	—	—	49	9	34	6·8
Aylesbury - - -	703	614	1	—	63	13	12	3·6
Buckingham - -	268	212	—	—	22	3	31	12·7
Eton - - - -	824	738	—	—	56	5	25	3·6
Newport Pagnell - -	810	640	5	—	95	8	62	8·6
Winslow - - -	208	117	—	—	22	—	69	33·2
Wycombe - - -	1,311	1,013	—	—	115	9	174	14·0
	4,759	3,877	6	—	422	47	407	9·5
CAMBRIDGE.								
Cambridge - - -	936	759	6	—	113	20	38	6·2
Caxton and Arrington -	231	205	—	—	12	—	14	6·1
Chesterton - - -	838	747	2	—	61	6	22	3·3
Ely - - - -	567	477	—	—	50	2	38	7·1
Linton - - -	331	235	—	—	34	2	10	3·6
Newmarket - - -	882	714	2	—	67	75	4	9·0
North Witchford - -	467	404	—	—	45	6	12	3·9
Whittlesey - - -	167	155	—	—	11	1	—	0·6
Wisbech - - -	860	732	1	—	83	16	28	5·1
	5,279	4,478	11	—	496	128	166	5·6

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	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
CHESTER.								
Altrincham	1,729	1,534	6	—	138	34	17	2·9
Birkenhead	4,389	3,814	13	—	448	26	88	2·6
Chester	1,496	1,275	6	—	167	18	30	3·2
Congleton	1,150	992	—	—	119	21	18	3·4
Macclesfield	1,605	1,388	—	—	172	23	22	2·8
Nantwich	2,129	1,701	3	—	248	44	133	8·3
Northwich	1,921	1,707	—	—	187	7	20	1·4
Runcorn	1,491	1,229	—	—	116	15	131	9·8
Stockport	4,056	3,044	6	—	524	120	362	11·9
Tarvin	369	322	—	—	29	3	15	4·9
Wirral	1,091	938	—	—	75	6	72	7·1
	21,426	17,944	34	—	2,223	317	908	5·7
CORNWALL.								
Austell, St.	914	782	—	—	72	18	47	6·6
Bodmin	459	402	—	—	41	4	12	3·5
Camelford	165	147	—	—	6	6	6	7·3
Columb, St., Major	402	340	2	—	36	12	12	6·0
Falmouth	575	101	1	—	49	—	424	73·7
Germans, St.	482	414	1	—	40	12	15	5·6
Helston	609	494	—	—	68	20	27	7·7
Launceston	423	379	—	—	30	4	10	3·3
Liskeard	654	555	1	—	54	11	33	6·7
Penzance	1,381	1,063	2	—	151	7	158	11·9
Redruth	1,488	892	—	—	293	22	281	20·4
Stratton	195	141	—	—	16	2	36	19·5
Truro	825	465	10	—	80	19	251	32·7
	8,572	6,175	17	—	936	132	1,312	16·8
CUMBERLAND.								
Alston-with-Garrigill	77	65	—	—	10	1	1	2·6
Bootle	522	378	—	—	50	17	77	18·0
Brampton	248	198	—	—	19	12	19	12·5
Carlisle	1,621	1,353	2	—	152	91	23	7·0
Cockermouth	2,385	1,656	1	—	260	68	398	19·5
Longtown	180	151	—	—	15	2	12	7·8
Penrith	575	519	1	—	44	4	7	1·9
Whitehaven	1,952	1,723	2	—	156	17	54	3·6
Wigton	692	610	1	—	65	5	11	2·3
	8,252	6,655	7	—	771	217	602	9·9
DERBY.								
Ashbourne	574	511	—	—	37	3	23	4·5
Bakewell	803	668	4	—	73	15	43	7·2
Belper	2,141	1,846	1	—	214	26	54	3·7
Chapel-en-le-Frith	692	572	—	—	51	14	55	10·0
Chesterfield	4,527	3,369	8	—	526	51	573	13·8
Derby	3,015	1,134	4	—	428	1	1,448	48·1
Glossop	773	603	1	—	103	9	57	8·5
Hayfield	335	272	1	—	38	8	16	7·2
Shardlow	1,669	1,268	4	—	162	33	202	14·1
	14,529	10,243	23	—	1,632	160	2,471	18·1

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DEVON.								
Axminster	411	374	2	—	20	2	13	3·6
Barnstaple	1,071	924	5	—	83	28	31	5·5
Bideford	529	465	1	—	34	5	4	1·7
Crediton	474	420	—	—	36	2	16	3·8
East Stonehouse	495	313	1	—	63	3	115	23·8
Exeter	961	726	2	—	116	38	79	12·2
Holsworthy	228	201	—	—	21	4	2	2·6
Honiton	484	433	—	—	33	7	11	3·7
Kingsbridge	462	413	—	—	36	3	10	2·8
Newton Abbot	1,860	1,660	2	—	151	14	33	2·5
Okehampton	397	348	—	—	27	3	19	5·5
Plymouth	2,498	1,909	6	—	252	31	300	13·3
Plympton St. Mary	677	565	—	—	49	6	57	9·3
Southmolton	396	354	—	—	17	19	6	6·3
Stoke Damerel	1,470	1,087	3	—	159	57	164	15·0
Tavistock	691	612	1	—	55	1	22	3·3
Thomas, St.	1,370	1,182	2	—	119	26	41	5·0
Tiverton	718	605	—	—	58	16	39	7·7
Torrington	323	282	1	—	27	1	12	4·0
Totnes	1,089	989	3	—	76	4	17	1·9
	16,604	13,882	29	—	1,432	270	991	7·6
DORSET.								
Beaminster	276	239	—	—	27	—	10	3·6
Blandford	328	280	—	—	28	4	16	6·1
Bridport	321	298	1	—	16	3	3	1·9
Cerne	155	129	—	—	20	3	3	3·9
Dorchester	480	418	—	—	38	9	15	5·0
Poole	801	674	3	—	74	12	38	6·2
Shaftesbury	281	243	2	—	17	5	14	6·8
Sherborne	284	241	—	—	28	—	15	5·3
Sturminster	241	213	—	—	21	—	7	2·9
Wareham and Purbeck	424	385	—	—	26	2	11	3·1
Weymouth	798	391	—	—	63	3	341	43·1
Wimborne and Cranborne	463	364	—	—	39	28	32	13·0
	4,852	3,875	6	—	397	60	505	11·8
DURHAM.								
Auckland	3,487	2,755	8	—	422	49	253	8·7
Chester-le-Street	2,067	1,731	—	—	220	30	86	5·6
Darlington	1,441	800	—	—	148	10	483	34·2
Durham	2,568	2,161	10	—	305	27	65	3·6
Easington	1,838	1,589	—	—	210	12	27	2·1
Gateshead	4,961	3,198	5	—	556	6	1,196	24·2
Hartlepool	2,585	2,132	6	—	267	30	150	6·9
Houghton-le-Spring	1,615	1,363	5	—	190	20	37	3·5
Lanchester	2,370	1,966	6	—	243	24	131	6·5
Sedgefield	745	619	1	—	87	9	29	5·1
South Shields	5,380	4,021	11	—	615	159	574	13·6
Stockton	2,183	1,781	2	—	245	30	125	7·1
Sunderland	6,076	5,102	11	—	625	101	237	5·6
Teesdale	569	475	—	—	51	17	26	7·5
Weardale	467	413	—	—	34	11	9	4·3
	38,352	30,106	65	—	4,218	535	3,428	10·3

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ESSEX.								
Billericay - - -	511	433	4	—	37	13	24	7·2
Braintree - - -	670	587	—	—	61	7	15	3·3
Chelmsford - - -	835	727	1	—	56	11	40	6·1
Colchester - - -	975	733	3	—	109	3	127	13·3
Dunmow - - -	410	371	—	—	27	4	8	2·9
Epping - - -	680	596	4	—	39	9	32	6·0
Halstead - - -	393	357	—	—	26	4	6	2·5
Lexden and Winstree -	580	516	—	—	42	9	13	3·8
Maldon - - -	609	540	1	—	42	1	25	4·3
Ongar - - -	272	227	—	—	25	8	12	7·4
Orsett - - -	1,012	718	9	—	103	19	163	18·0
Rochford - - -	909	724	1	—	69	21	94	12·6
Romford - - -	1,817	1,306	3	1	170	20	317	18·5
Saffron Walden - -	438	383	1	—	32	1	21	5·0
Tendring - - -	1,109	954	3	—	92	25	35	5·4
West Ham - - -	13,768	9,389	60	—	1,376	369	2,574	21·4
	24,988	18,561	90	1	2,306	524	3,506	16·1
GLOUCESTER.								
Barton Regis - -	5,784	4,618	20	—	555	182	409	10·2
Bristol - - -	1,550	1,183	4	—	179	6	178	11·9
Cheltenham - - -	1,229	779	2	—	153	7	288	24·0
Chipping Sodbury - -	414	337	—	—	32	14	31	10·9
Cirencester - - -	491	353	—	—	44	5	89	9·1
Dursley - - -	310	227	—	—	14	11	58	22·3
Gloucester - - -	1,518	39	—	—	160	—	1,319	86·9
Newent - - -	283	228	—	—	24	5	26	11·0
Northleach - -	207	169	—	—	19	4	15	9·2
Stow-on-the-Wold - -	237	194	1	—	20	11	11	9·3
Stroud - - -	1,049	825	—	—	98	17	109	12·0
Tetbury - - -	166	112	—	—	14	5	35	24·1
Tewkesbury - - -	353	113	1	—	28	—	211	59·8
Thornbury - - -	455	405	—	—	34	3	13	35·2
Westbury-on-Severn -	797	289	—	—	99	20	389	51·3
Wheatenhurst - -	168	40	—	—	11	11	106	69·6
Winchcomb - - -	247	195	—	—	23	10	9	11·7
	15,258	10,106	28	—	1,507	311	3,306	23·7
HEREFORD.								
Bromyard - - -	260	223	1	—	18	7	11	6·9
Dore - - -	187	160	—	—	11	6	10	8·6
Hereford - - -	891	747	1	—	86	19	38	6·4
Kington - - -	272	236	—	—	22	6	8	5·1
Ledbury - - -	338	283	—	—	31	4	20	7·1
Leominster - - -	339	292	—	—	24	7	16	6·8
Ross - - -	415	355	—	—	28	7	25	7·7
Weobley - - -	192	165	—	—	19	2	6	4·2
	2,894	2,461	2	—	239	58	134	6·6

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HERTS.								
Albans, St.	765	351	—	—	90	23	301	42·4
Barnet	1,243	997	6	—	76	24	140	13·2
Berkhampstead	434	379	—	—	36	4	15	4·4
Bishop's Stortford	570	497	2	—	44	7	20	4·7
Buntingford	135	124	—	—	6	—	5	3·7
Hatfield	202	176	1	—	13	2	10	5·9
Hemel Hempstead	374	265	—	1	41	1	66	17·9
Hertford	396	356	—	—	25	5	10	3·8
Hitchin	744	665	—	—	60	—	19	2·5
Royston	406	368	—	—	22	4	12	3·9
Ware	515	463	—	—	38	4	10	2·7
Watford	1,078	782	4	—	69	3	220	20·7
Welwyn	62	54	1	—	4	—	3	4·8
	6,924	5,477	14	1	524	77	831	13·1
HUNTINGDON.								
Huntingdon	525	453	—	—	59	4	9	2·3
Ives, St.	391	356	—	—	28	4	3	1·8
Neots, St.	390	330	—	—	38	2	20	5·6
	1,306	1,139	—	—	125	10	32	3·2
KENT (Extra-Metropolitan).								
Ashford, East	372	332	3	—	26	6	5	2·9
Ashford, West	557	436	—	—	58	24	39	11·3
Blean	555	467	—	—	54	8	23	6·1
Bridge	329	279	1	—	21	4	24	8·5
Bromley	1,877	1,437	15	—	262	35	128	8·7
Canterbury	474	405	—	—	43	3	23	5·5
Cranbrook	345	303	—	—	22	11	9	5·8
Dartford	2,176	1,712	6	2	210	21	225	11·3
Dover	1,071	794	1	—	105	38	133	15·9
Eastry	717	650	1	—	43	—	23	3·2
Elham	1,110	933	2	—	104	20	51	6·4
Faversham	799	720	1	—	60	4	14	2·3
Gravesend and Milton	681	518	6	—	58	5	94	14·5
Hollingbourn	351	300	—	—	38	—	13	3·7
Hoo	123	107	—	—	14	—	2	1·6
Maidstone	1,302	754	—	—	105	15	428	34·0
Malling	837	733	—	—	64	6	34	4·8
Medway	2,306	2,015	3	—	201	27	60	3·8
Milton	858	712	—	—	76	30	40	8·2
Romney Marsh	163	146	1	—	11	2	3	3·1
Sevenoaks	727	626	—	—	53	15	33	6·6
Sheppey	514	448	2	—	46	4	14	3·5
Strood	1,244	1,060	4	—	95	3	82	6·8
Tenterden	253	223	—	—	21	3	6	3·6
Thanet, Isle of	1,322	1,181	3	—	107	9	22	2·3
Tonbridge	1,504	817	2	—	160	31	494	34·9
	22,567	18,108	51	2	2,057	324	2,025	10·4

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LANCASTER.								
Ashton-under-Lyne -	4,954	2,297	10	—	776	77	1,794	37·8
Barrow-in-Furness -	1,723	1,533	4	—	135	10	41	3·0
Barton-upon-Irwell -	2,074	2,235	11	—	312	50	66	4·3
Blackburn - - -	6,547	5,084	24	—	818	77	544	9·5
Bolton - - -	7,599	6,597	9	—	755	26	212	3·1
Burnley - - -	5,677	2,017	23	—	798	126	1,813	34·2
Bury - - - -	3,776	1,683	7	—	517	18	1,549	41·5
Chorley - - -	1,874	1,564	2	—	183	19	106	6·7
Chorlton - - -	9,412	7,381	17	—	1,147	170	697	9·2
Clitheroe - - -	645	513	1	—	62	15	54	10·7
Fylde, The - - -	1,629	1,319	6	—	195	37	72	6·7
Garstang - - -	292	252	—	—	22	2	16	6·2
Haslingden - - -	2,936	2,265	2	—	311	32	326	12·2
Lancaster - - -	1,566	1,316	7	—	153	33	57	5·7
Leigh - - - -	2,752	2,324	3	—	264	17	144	5·9
Liverpool - - -	4,963	4,120	11	—	639	12	181	3·9
Lunesdale - - -	188	169	—	—	14	1	4	2·7
Manchester - - -	5,049	4,308	3	—	607	35	96	2·6
Oldham - - -	6,004	340	—	—	911	—	4,753	79·2
Ormskirk - - -	2,721	2,280	15	—	269	35	122	5·8
Prescot - - -	5,414	4,449	11	1	615	102	236	6·2
Preston - - -	4,705	3,331	8	—	740	57	569	13·3
Prestwich - - -	5,012	3,821	9	—	478	82	622	14·0
Rochdale - - -	3,003	2,061	6	—	350	21	565	19·5
Salford - - -	7,448	5,506	20	—	845	236	841	14·5
Todmorden - - -	863	476	—	—	99	—	288	33·4
Toxteth Park - -	4,126	2,898	19	—	500	258	451	17·2
Ulverston - - -	1,213	1,044	4	—	104	34	27	5·0
Warrington - - -	3,331	2,889	5	—	321	20	96	3·5
West Derby - - -	15,447	13,018	49	—	1,491	125	764	5·7
Wigan - - -	7,240	5,774	17	—	813	204	432	8·8
	130,783	95,766	303	1	15,244	1.931	17,538	14·9
LEICESTER.								
Ashby-de-la-Zouch - -	1.328	682	—	—	158	14	474	36·7
Barrow-on-Soar - -	706	62	—	—	64	2	578	82·2
Billesdon - - -	150	114	—	—	15	1	20	14·0
Blaby - - -	722	51	—	—	89	—	582	80·6
Hinckley - - -	688	114	—	—	111	—	463	67·3
Leicester - - -	5,816	132	—	—	1,024	—	4,660	80·1
Loughborough - -	947	135	—	—	118	1	693	73·3
Lutterworth - -	275	223	—	—	27	1	24	9·1
Market Bosworth - -	573	459	2	—	57	7	48	9·6
Market Harborough -	411	258	—	—	29	8	116	30·2
Melton Mowbray - -	583	201	—	—	64	—	318	54·5
	12,199	2,431	2	—	1,756	34	7,976	65·7
LINCOLN.								
Boston - - -	1,018	800	1	—	108	74	35	10·7
Bourne - - -	524	410	—	—	39	10	65	14·3
Caistor - - -	439	367	3	—	38	13	18	7·1
Gainsborough - -	969	515	—	—	139	2	313	32·5
Glanford Brigg - -	1,254	1,054	7	—	139	9	45	4·3
Grantham - - -	975	814	19	—	102	5	35	4·1
Grimsby - - -	2,165	1,676	5	—	260	78	146	10·3

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LINCOLN—*cont.*								
Holbeach	406	344	—	—	44	5	103	21·8
Horncastle	482	411	—	—	37	10	24	7·3
Lincoln	1,822	1,424	—	—	207	75	116	10·5
Louth	779	635	2	—	77	20	45	8·3
Sleaford	584	464	3	—	56	6	55	10·4
Spalding	566	392	—	—	55	6	113	21·0
Spilsby	623	543	2	—	48	7	23	4·8
Stamford	430	359	—	—	41	1	29	6·9
	13,126	10,268	42	—	1,390	321	1,165	11·3
MIDDLESEX (Extra-Metropolitan).								
Brentford	3,843	3,146	42	—	339	19	297	8·2
Edmonton	7,767	5,953	24	—	641	135	1,014	14·8
Hendon	3,103	2,327	15	—	247	30	484	16·6
Staines	736	515	1	—	79	10	131	19·2
Uxbridge	837	723	3	—	63	7	41	5·7
	16,286	12,664	85	—	1,369	201	1,967	13·3
MONMOUTH.								
Abergavenny	759	639	—	—	76	25	19	5·8
Bedwellty	2,678	2,099	—	—	274	121	184	11·4
Chepstow	529	429	1	—	39	7	53	11·3
Monmouth	832	655	1	—	62	19	95	13·7
Newport	3,717	3,153	6	—	368	63	128	5·1
Pontypool	1,531	1,203	1	—	121	52	154	13·5
	10,046	8,178	9	—	910	286	633	9·1
NORFOLK.								
Aylsham	495	441	—	—	36	3	15	3·6
Blofield	315	253	—	—	33	6	23	9·2
Depwade	611	504	—	—	62	14	31	7·4
Docking	456	375	—	—	45	15	21	7·9
Downham	509	449	2	—	42	2	14	3·1
Erpingham	497	421	—	—	45	12	19	6·2
Faith, St.	329	237	—	—	24	12	56	20·7
Flegg, East and West	289	251	—	—	22	10	6	5·5
Forehoe	309	250	—	—	25	1	33	11·0
Freebridge Lynn	340	294	—	—	22	2	22	7·1
Guiltcross	289	254	—	—	18	2	15	5·9
Henstead	260	209	—	—	26	—	25	9·6
King's Lynn	521	44	—	—	63	—	414	79·5
Loddon and Clavering	345	295	1	—	35	5	9	4·1
Mitford and Launditch	720	612	2	—	64	11	31	5·8
Norwich	3,153	825	3	—	548	5	1,772	56·4
Smallburgh	450	363	—	—	38	8	41	10·9
Swaffham	317	244	—	—	28	10	35	14·2
Thetford	463	411	—	—	41	5	6	2·4
Walsingham	554	461	2	—	48	14	29	7·8
Wayland	269	242	—	—	17	4	6	3·7
Yarmouth, Great	1,342	1,038	1	—	147	25	131	11·6
	12,833	8,473	11	—	1,429	166	2,754	22·8

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NORTHAMPTON.								
Brackley	309	73	—	—	28	—	208	67·3
Brixworth	334	237	—	—	32	1	64	19·5
Daventry	477	398	—	—	37	13	29	8·8
Hardingstone	310	209	3	—	33	2	63	21·0
Kettering	1,358	86	—	—	190	—	1,082	79·7
Northampton	2,568	160	—	—	351	15	2,042	80·1
Oundle	275	221	—	—	23	15	16	11·2
Peterborough	1,343	1,164	—	—	117	5	57	4·6
Potterspury	344	281	—	—	32	11	20	9·0
Thrapston	339	57	—	—	32	—	310	77·7
Towcester	300	224	—	—	35	21	20	13·7
Wellingborough	1,471	54	—	—	163	—	1,254	85·2
	9,488	3,164	3	—	1,073	83	5,165	55·3
NORTHUMBERLAND.								
Alnwick	658	549	1	—	57	21	30	7·8
Belford	109	98	—	—	11	—	—	0·0
Bellingham	120	107	—	—	8	1	4	4·2
Berwick-upon-Tweed	514	457	—	—	45	8	4	2·3
Castle Ward	838	689	2	—	79	6	62	8·1
Glendale	242	225	1	—	12	1	3	1·7
Haltwhistle	212	150	1	—	13	6	42	22·6
Hexham	858	703	—	—	81	14	60	8·6
Morpeth	1,557	1,107	—	—	318	6	126	8·5
Newcastle-on-Tyne	7,058	5,782	17	—	676	102	481	8·3
Rothbury	126	116	—	—	8	1	1	1·6
Tynemouth	4,888	3,584	13	—	619	249	423	13·7
	17,180	13,567	35	—	1,927	415	1,236	9·6
NOTTINGHAM.								
Basford	5,830	4,234	7	—	693	152	744	15·4
Bingham	393	306	3	—	24	25	35	15·3
East Retford	651	579	—	—	48	5	19	3·7
Mansfield	2,254	1,632	—	—	265	21	336	15·9
Newark	825	719	2	—	71	6	27	4·0
Nottingham	5,143	3,464	16	—	657	46	960	19·6
Southwell	457	391	3	—	34	12	17	6·3
Worksop	1,144	1,001	1	—	105	16	21	3·2
	16,697	12,326	32	—	1,897	283	2,159	14·6
OXFORD.								
Banbury	807	188	1	—	78	5	535	66·9
Bicester	361	313	—	—	21	7	20	7·5
Chipping Norton	465	330	—	—	38	10	87	20·9
Headington	964	859	7	—	87	1	10	1·1
Henley	593	498	2	—	57	10	46	9·4
Oxford	594	490	4	—	62	10	28	6·4
Thame	353	300	1	—	27	3	22	7·1
Witney	571	508	1	—	49	2	11	2·3
Woodstock	354	292	2	—	26	6	28	9·6
	5,062	3,778	18	—	425	54	787	16·6

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RUTLAND.								
Oakham - - -	297	276	—	—	15	2	4	2·0
Uppingham - - -	243	218	2	—	13	2	8	4·1
	540	494	2	—	28	4	12	3·0
SALOP.								
Atcham - - -	1,228	1,022	2	—	109	19	76	7·7
Bridgnorth - - -	355	295	—	—	38	—	22	6·2
Church Stretton - -	131	124	—	—	5	—	2	1·5
Cleobury Mortimer -	237	213	—	—	15	3	6	3·8
Clun - - - -	264	163	—	—	16	12	73	32·2
Drayton - - -	368	340	—	—	23	5	—	1·4
Ellesmere - - -	344	300	—	—	36	4	4	2·3
Ludlow - - -	476	394	2	—	45	15	20	7·4
Madeley - - -	639	533	—	—	76	9	21	4·7
Newport - - -	390	341	—	—	28	5	16	5·4
Oswestry - - -	718	649	4	—	46	—	19	2·6
Shifnal - - -	357	295	—	—	35	4	23	7·6
Wellington - - -	694	570	1	—	66	9	48	8·2
Wem - - - -	254	235	2	—	12	—	5	2·0
Whitchurch - - -	322	284	1	—	25	4	8	3·7
	6,777	5,758	12	—	575	89	343	6·4
SOMERSET.								
Axbridge - - -	999	504	—	—	93	25	377	40·2
Bath - - - -	1,792	1,092	—	—	190	107	403	28·5
Bedminster - - -	2,586	1,658	7	—	297	115	509	24·1
Bridgwater - - -	936	713	3	—	89	35	96	13·9
Chard - - -	689	592	—	—	48	17	32	7·1
Clutton - - -	756	667	2	—	53	3	31	4·5
Dulverton - - -	99	91	—	—	5	—	3	3·0
Frome - - -	567	501	—	—	33	1	32	5·8
Keynsham - - -	1,017	704	5	—	90	8	210	21·4
Langport - - -	376	317	—	—	35	3	21	6·4
Shepton Mallet - -	435	364	—	—	30	—	41	9·4
Taunton - - -	976	839	—	—	83	14	85	5·0
Wellington - - -	466	369	1	—	35	16	45	13·1
Wells - - -	668	556	—	—	56	6	50	8·4
Williton - - -	425	387	1	—	24	5	8	3·1
Wincanton - - -	439	389	3	—	25	4	18	5·0
Yeovil - - -	727	623	1	—	61	17	25	5·8
	13,953	10,366	23	—	1,252	376	1,936	16·6
SOUTHAMPTON.								
Alresford - - -	177	160	—	—	12	2	3	2·8
Alton - - - -	362	319	1	—	29	1	12	3·6
Alverstoke - - -	753	658	1	—	72	7	15	2·9
Andover - - -	445	356	1	—	39	8	41	11·0
Basingstoke - - -	529	285	—	—	43	2	199	38·0
Catherington - -	63	54	—	—	3	—	6	9·5
Christchurch - -	1,389	961	3	—	149	37	239	19·9
Droxford - - -	284	251	3	—	21	2	7	3·2
Fareham - - -	508	465	2	—	31	4	6	2·0
Fordingbridge - -	180	154	—	—	16	—	10	5·6

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SOUTHAMPTON—*cont.*								
Hartley Wintney	613	505	—	—	54	11	43	8·8
Havant	251	222	—	—	18	2	9	4·4
Hursley	76	68	—	—	5	—	3	3·9
Kingsclere	226	213	—	—	8	2	3	2·2
Lymington	357	315	—	—	27	4	11	4·2
New Forest	345	301	—	—	25	4	15	5·5
Petersfield	321	275	—	—	22	3	21	7·5
Portsea Island	4,600	3,987	19	—	435	28	131	3·5
Ringwood	142	133	1	—	8	—	—	—
Romsey	292	256	1	—	23	3	9	4·1
Southampton	1,637	1,284	9	—	172	49	123	10·5
South Stoneham	1,468	1,226	5	—	120	31	86	8·0
Stockbridge	154	127	—	—	13	4	10	9·1
Whitchurch	171	141	—	—	19	6	5	6·4
Wight, Isle of	1,800	1,518	2	—	175	29	76	5·8
Winchester, New	782	689	1	—	54	12	26	4·9
	18,925	15,923	49	—	1,593	251	1,109	7·2
STAFFORD.								
Burton-upon-Trent	2,790	1,912	2	—	326	17	533	19·7
Cannock	1,508	1,152	—	—	198	10	148	10·6
Cheadle	749	637	—	—	62	2	48	6·7
Leek	1,044	852	—	—	105	56	31	8·3
Lichfield	1,319	1,154	6	—	127	13	19	2·4
Newcastle-under-Lyme	1,398	1,245	3	—	138	—	12	0·9
Seisdon	483	414	1	—	38	4	26	6·2
Stafford	847	685	5	—	85	22	50	8·2
Stoke-upon-Trent	4,544	3,619	1	—	632	54	238	6·4
Stone	1,001	863	1	—	97	17	23	4·0
Tamworth	722	549	—	—	87	18	68	10·5
Uttoxeter	422	375	1	—	28	4	14	4·3
Walsall	3,887	2,368	7	—	547	61	904	24·8
West Bromwich	5,069	3,665	14	5	531	252	602	16·8
Wolstanton and Burslem	3,260	2,678	4	—	402	24	152	5·4
Wolverhampton	4,949	3,372	16	—	565	72	924	20·1
	33,992	25,540	61	5	3,968	626	3,792	13·0
SUFFOLK.								
Blything	696	600	—	—	43	5	48	7·6
Bosmere and Claydon	448	380	—	—	32	9	27	8·0
Bury St. Edmunds	430	356	1	—	50	13	10	5·3
Cosford	448	395	—	—	36	2	15	3·8
Hartismere	436	373	—	—	37	2	24	6·0
Hoxne	303	274	1	—	19	3	6	3·0
Ipswich	1,711	992	10	—	221	85	403	28·5
Mildenhall	237	216	—	—	20	1	—	0·4
Mutford and Lothingland	1,119	978	4	—	92	8	37	4·0
Plomesgate	520	447	—	—	41	4	28	6·1
Risbridge	504	439	—	—	52	5	8	2·6
Samford	329	295	1	—	16	4	13	5·1
Stow	528	462	—	—	46	5	15	3·8
Sudbury	762	660	—	—	45	16	41	7·5
Thingoe	382	331	—	—	34	8	9	4·5
Wangford	421	364	1	—	37	5	14	4·5
Woodbridge	606	530	—	—	38	8	30	6·3
	9,880	8,092	18	—	859	183	728	9·2

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SURREY (Extra-Metropolitan).								
Chertsey	818	655	1	—	61	37	64	12·3
Croydon	4,037	2,823	16	—	365	87	746	20·6
Dorking	376	309	2	—	21	5	39	11·7
Epsom	1,174	905	2	—	96	24	147	14·6
Farnham	1,494	1,236	2	—	135	18	103	8·1
Godstone	458	400	—	—	29	3	26	6·3
Guildford	1,332	1,030	1	—	110	45	146	14·3
Hambledon	474	427	—	—	27	2	18	4·2
Kingston	2,918	2,306	12	—	249	93	258	12·0
Reigate	863	666	2	—	72	38	85	14·2
Richmond	1,016	890	5	—	92	3	26	2·9
	14,960	11,647	43	—	1,257	355	1,658	13·5
SUSSEX.								
Battle	479	319	1	—	40	36	83	24·8
Brighton	2,667	2,197	8	—	262	64	136	7·5
Chailey	237	180	1	—	9	8	39	19·8
Chichester	177	159	1	—	14	—	3	1·7
Cuckfield	562	484	—	—	33	9	36	8·0
Eastbourne	1,078	276	1	—	132	7	662	62·1
East Grinstead	542	406	—	—	27	28	81	20·1
East Preston	741	663	—	—	45	20	13	4·5
Hailsham	410	316	3	—	35	8	48	13·7
Hastings	1,381	933	4	—	123	58	263	23·2
Horsham	612	516	—	—	54	9	33	6·8
Lewes	283	132	1	—	33	1	116	41·3
Midhurst	357	315	1	—	28	7	6	3·6
Newhaven	270	230	—	—	24	5	11	5·9
Petworth	214	200	—	—	13	1	—	0·5
Rye	309	253	1	—	26	9	20	9·4
Steyning	1,424	1,264	4	—	100	18	38	3·9
Thakeham	185	166	—	—	10	2	7	4·9
Ticehurst	414	323	—	—	37	9	45	13·0
Uckfield	544	369	1	—	43	5	126	24·1
Westbourne	203	172	—	—	20	2	9	5·4
West Firle	58	48	—	—	3	2	5	12·1
Westhampnett	406	433	—	—	37	9	17	5·2
	5,369	4,421	8	—	428	79	433	9·5
WARWICK.								
Alcester	529	442	—	—	56	7	24	5·9
Aston	9,140	6,830	34	1	1,015	146	1,114	13·7
Atherstone	541	407	—	—	58	—	76	14·0
Birmingham	8,263	6,568	15	2	1,029	48	601	7·9
Coventry	1,716	121	—	—	182	—	1,413	82·3
Foleshill	703	411	—	—	81	—	211	30·0
Meriden	262	204	—	—	26	1	31	12·2
Nuneaton	629	154	—	—	68	—	407	64·7
Rugby	744	612	—	—	63	16	53	9·3
Solihull	848	685	6	—	70	13	74	10·3
Southam	317	269	—	—	34	1	13	4·4
Stratford-upon-Avon	521	454	—	—	46	2	19	4·0
Warwick	1,246	1,034	2	—	109	22	79	8·1
	25,459	18,191	57	3	2,837	256	4,115	17·2

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WESTMORLAND.								
East Ward - - -	364	328	—	—	23	4	9	3·6
Kendal - - -	1,115	1,006	1	—	78	10	20	2·7
West Ward - - -	206	170	—	—	18	—	18	8·7
	1,685	1,504	1	—	119	14	47	3·6
WILTS.								
Alderbury - - -	685	582	1	—	56	13	33	6·7
Amesbury - - -	169	149	1	—	12	1	6	4·1
Bradford - - -	275	242	—	—	22	1	10	4·0
Calne - - -	198	159	3	—	11	12	13	12·6
Chippenham - -	577	488	—	—	40	30	19	8·5
Cricklade and Wootton Bassett.	368	295	—	—	31	16	26	11·4
Devizes - - -	492	413	—	—	30	15	34	10·0
Highworth and Swindon -	1,676	981	1	—	177	93	424	30·8
Malmesbury - - -	325	261	—	—	22	14	28	12·9
Marlborough - -	233	216	—	—	14	—	3	1·3
Melksham - - -	450	387	—	—	34	6	23	6·4
Mere - - - -	160	139	1	—	12	4	4	5·0
Pewsey - - -	288	254	2	—	24	1	7	2·8
Tisbury - - -	196	160	—	—	13	9	14	11·7
Warminster - - -	327	253	—	—	24	2	48	15·3
Westbury and Whorwellsdown.	238	211	—	—	19	3	5	3·4
Wilton - - -	268	242	—	—	17	6	3	3·4
	6,925	5,432	9	—	558	226	700	13·4
WORCESTER.								
Bromsgrove - - -	941	777	2	—	94	34	34	7·2
Droitwich - - -	497	415	—	—	35	8	9	3·4
Dudley - - -	5,536	4,631	19	—	599	45	242	5·2
Evesham - - -	465	360	—	—	40	9	56	14·0
Kidderminster - -	1,115	977	2	—	104	5	27	2·9
King's Norton - -	3,733	2,619	8	—	388	72	646	19·2
Martley - - -	400	364	—	—	29	7	—	1·7
Pershore - - -	346	317	—	—	22	—	7	2·0
Shipston-on-Stour - -	441	382	—	—	20	7	32	8·8
Stourbridge - - -	3,033	2,623	3	—	344	14	49	2·1
Tenbury - - -	192	172	1	—	12	4	3	3·6
Upton-on-Severn - -	519	427	1	—	51	4	36	7·7
Worcester - - -	1,271	878	—	1	176	22	194	17·0
	18,489	14,972	36	1	1,914	231	1,335	8·5
YORK, East Riding.								
Beverley - - -	732	622	2	—	74	11	23	4·6
Bridlington - - -	451	354	—	—	45	—	52	11·5
Driffield - - -	507	455	—	—	42	5	5	2·0
Howden - - -	339	297	1	—	33	—	8	2·4
Kingston-upon-Hull -	2,657	2,036	10	—	343	25	243	10·1
Patrington - - -	213	174	—	—	24	—	15	7·0
Pocklington - - -	384	342	—	—	31	3	8	2·9
Sculcoates - - -	4,818	3,891	18	—	540	31	338	7·7
Skirlaugh - - -	244	211	—	—	18	7	8	6·1
York - - - -	2,419	1,984	8	—	270	40	117	6·5
	12,764	10,366	39	—	1,420	122	817	7·4

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YORK, NORTH RIDING.								
Ayagarth - - -	123	108	1	—	15	—	1	0·8
Bedale - - -	216	196	—	—	14	—	6	2·8
Easingwold - - -	231	189	—	—	25	3	14	7·4
Guisborough - -	1,207	1,020	4	—	103	15	65	6·6
Helmsley - - -	138	110	—	—	16	9	3	8·7
Kirkby Moorside - -	120	103	—	—	9	4	4	6·7
Leyburn - - -	144	129	—	—	10	—	5	3·5
Malton - - -	583	475	1	—	54	8	45	9·1
Middlesbrough - -	4,403	3,693	2	—	568	54	86	3·2
Northallerton - -	277	238	—	—	28	1	10	4·0
Pickering - - -	304	253	—	—	31	8	12	6·6
Reeth - - -	78	70	—	—	6	2	—	2·6
Richmond - - -	331	276	—	—	37	4	14	5·4
Scarborough - -	1,214	660	8	—	144	14	388	33·1
Stokesley - - -	322	294	—	2	19	1	6	2·2
Thirsk - - -	287	257	—	—	24	2	4	2·1
Whitby - - -	660	574	1	—	49	10	26	5·5
	10,640	8,645	17	2	1,152	135	689	7·7
YORK, WEST RIDING.								
Barnsley - - -	4,208	3,491	7	1	470	17	222	5·7
Bierley, North - -	3,544	2,228	7	—	390	37	682	25·9
Bradford - - -	5,644	3,600	14	—	751	38	1,241	22·7
Bramley - - -	2,237	1,778	5	—	272	2	180	8·1
Dewsbury - - -	4,616	2,139	9	1	727	73	1,667	37·7
Doncaster - - -	2,201	1,702	16	—	250	97	136	10·6
Ecclesall Bierlow - -	4,617	3,827	27	1	509	18	235	5·5
Goole - - -	941	777	5	—	90	10	59	7·3
Halifax - - -	4,784	612	7	—	610	5	3,550	74·3
Hemsworth - - -	606	515	—	—	52	5	34	6·4
Holbeck - - -	927	770	1	—	100	23	33	6·0
Huddersfield - -	4,106	3,644	12	—	357	7	86	2·3
Hunslet - - -	2,670	2,284	5	—	279	38	64	3·8
Keighley - - -	1,901	80	1	—	239	—	1,581	83·2
Knaresborough - -	696	506	1	—	56	38	95	19·1
Leeds - - -	7,460	6,261	21	—	764	57	357	5·5
Ouseburn, Great - -	301	262	1	—	27	2	9	3·7
Pateley Bridge - -	204	187	—	—	13	4	—	2·0
Penistone - - -	565	467	2	—	58	7	11	3·2
Pontefract - - -	2,340	1,946	2	—	279	27	86	4·8
Ripon - - -	392	328	—	—	26	13	25	9·7
Rotherham - - -	3,588	3,031	6	—	356	21	174	5·4
Saddleworth - -	618	96	—	—	77	—	445	72·0
Sedbergh - - -	108	94	—	—	12	1	1	1·9
Selby - - - -	459	398	—	—	44	3	14	3·7
Settle - - - -	367	304	—	—	38	5	20	6·8
Sheffield - - -	7,736	6,308	27	—	891	17	493	6·6
Skipton - - -	1,117	577	3	—	108	21	408	38·4
Tadcaster - - -	910	788	3	—	81	4	34	4·2
Thorne - - -	387	290	—	—	36	33	28	15·8
Wakefield - - -	3,220	2,676	2	—	366	21	155	5·5
Wetherby - - -	347	282	—	—	29	8	28	10·4
Wharfedale - - -	1,363	1,090	4	—	118	33	118	11·1
Wortley - - -	1,454	1,200	1	1	151	20	81	6·9
	76,634	54,558	189	4	8,626	705	12,552	17·3

—	RETURNS, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
ANGLESEY.								
Anglesey - - -	339	304	—	—	26	—	9	2·7
Holyhead - - -	510	448	—	—	41	2	19	4·1
	849	752	—	—	67	2	28	3·5
BRECKNOCK.								
Brecknock - - -	376	331	—	—	39	1	5	1·6
Builth - - - -	214	194	—	—	16	1	3	1·9
Crickhowell - - -	693	572	—	—	66	13	42	7·9
Hay - - - -	245	183	—	—	27	25	10	14·3
	1,528	1,280	—	—	148	40	60	6·5
CARDIGAN.								
Aberayron - - -	301	269	—	—	26	3	3	2·0
Aberystwith - -	482	425	1	—	33	5	18	4·8
Cardigan - - -	358	283	—	—	41	9	25	9·5
Lampeter - - -	226	183	—	—	26	15	2	7·5
Tregaron - - -	208	189	—	—	17	—	2	1·0
	1,575	1,349	1	—	143	32	50	5·2
CARMARTHEN.								
Carmarthen - - -	883	778	—	—	92	4	9	1·5
Llandilofawr - -	604	528	—	—	69	2	5	1·2
Llandovery - - -	280	242	—	—	30	8	—	2·9
Llanelly - - -	1,890	1,556	1	—	145	13	175	9.9
Newcastle-Emlyn - -	518	458	—	—	46	4	10	2·7
	4,175	3,562	1	—	382	31	199	5·5
CARNARVON.								
Bangor and Beaumaris -	923	765	4	—	87	10	57	7·3
Carnarvon - - -	986	726	2	—	119	17	122	14·1
Conway - - -	641	541	—	—	61	3	36	6·1
Pwllheli - - -	516	454	2	—	47	6	7	2·5
	3,066	2,486	8	—	314	36	222	8·4
DENBIGH.								
Llanrwst - - -	318	276	—	—	27	13	2	4·7
Ruthin - - -	286	264	—	—	21	1	—	0·3
Wrexham - - -	2,195	1,883	4	—	223	24	61	3·9
	2,799	2,423	4	—	271	38	63	3·6

—	Returns, 1892.							
	Births.	Successfully Vaccinated.	Insusceptible of Vaccination.	Had Small-pox.	Died unvaccinated.	Vaccination postponed.	Remaining.	Children not finally accounted for (including cases postponed), per cent. of births.
FLINT.								
Asaph, St.	676	575	—	—	71	5	25	4·4
Hawarden	473	419	—	—	40	6	8	3·0
Holywell	1,216	1,018	1	—	124	34	39	6·0
	2,365	2,012	1	—	235	45	72	4·9
GLAMORGAN.								
Bridgend and Cowbridge	1,906	1,603	1	—	234	23	45	3·6
Cardiff	6,580	5,485	23	—	674	24	374	6·0
Gower	316	273	—	—	23	—	20	6·3
Merthyr Tydfil	4,713	4,003	3	—	568	91	48	3·0
Neath	2,139	1,869	1	—	212	24	33	2·7
Pontardawe	833	749	—	—	72	6	6	1·4
Pontypridd	6,491	5,345	8	—	853	85	200	4·4
Swansea	4,077	3,491	3	—	405	—	178	4·4
	27,055	22,818	39	—	3,041	253	904	4·3
MERIONETH.								
Bala	148	130	1		11	4	2	4·1
Corwen	417	352	1	—	40	11	13	5·8
Dolgelley	324	290	—	-	24	7	3	3·1
Festiniog	755	644	—	—	81	19	11	3·9
	1,644	1,416	2	—	156	41	29	4·3
MONTGOMERY.								
Forden	412	361	—	—	35	6	10	3·9
Llanfyllin	444	396	—	—	34	7	7	3·2
Machynlleth	239	210	—	—	19	6	4	4·2
Newtown and Llanidloes	576	494	—	—	45	11	26	6·4
	1,671	1,461	—	—	133	30	47	4·6
PEMBROKE.								
Haverfordwest	929	731	1	—	108	23	66	9·6
Narberth	476	430	—	—	32	4	10	2·9
Pembroke	893	770	—	—	79	21	23	4·9
	2,298	1,931	1	—	219	48	99	6·4
RADNOR.								
Knighton	288	162	—	—	31	1	94	33·0
Rhayader	140	112	—	—	13	—	15	10·7
	428	274	—	—	44	1	109	25·7

No. 2.

List (alphabetically arranged) of 227 Unions inspected during the Year 1894, with reference to the Proceedings under the Vaccination Acts, 1867 and 1871, and an Account of the Awards certified by the Board as payable to the respective Public Vaccinators out of County Funds.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.		Total Sum awarded in each Union.	Medical Inspector.
			Minimum.	Maximum.		
			£ s. d.	£ s. d.	£ s. d.	
Aberayron	2	2	11 6 0	12 2 0	23 8 0	Mr. Evans.
Aberystwith	4	3	10 0 0	16 6 0	43 5 0	Do.
Albans, St.	5	3	2 7 0	10 4 0	20 11 0	Mr. Royle.
Alnwick	7	5	1 4 0	15 0 0	29 9 0	Dr. Wilson.
Alston-with-Garrigill	2	1	—	—	4 8 0	" Horne.
Anglesey	3	3	9 14 0	19 15 0	42 8 0	Mr. Evans.
Ashbourne	6	5	1 17 0	23 13 0	45 6 0	" Royle.
Ashby-de-la-Zouch	5	3	7 12 0	8 16 0	24 16 0	Dr. Fletcher.
Ashford, East	6	5	2 10 0	7 16 0	26 13 0	" Sweeting.
Ashford, West	4	4	2 13 0	18 0 0	36 16 0	Do.
Ashton-under-Lyne	12	4	0 19 0	16 10 0	31 4 0	Dr. Wilson.
Axbridge	11	8	1 4 0	5 16 0	24 2 0	" Horne.
Axminster	12	6	1 1 0	4 14 0	17 13 0	Mr. Royle.
Aylesbury	8	7	3 11 0	21 8 0	50 6 0	Do.
Aysgarth	2	1	—	—	4 4 0	Dr. Horne.
Bakewell	8	7	3 1 0	15 0 0	66 19 0	Mr. Royle.
Barnsley	6	5	14 13 0	60 4 0	157 1 0	Dr. Horne.
Barnstaple	10	7	0 14 0	24 17 0	62 18 0	Mr. Royle.
Barrow-in-Furness	1	1	—	—	173 7 0	Mr. Evans.
Barton-upon-Irwell	7	5	4 10 0	44 4 0	122 12 0	Do.
Bath	5	4	2 4 0	18 11 0	38 19 0	Dr. Horne.
Bedale	4	3	2 11 0	5 5 0	12 13 0	Do.
Bedminster	9	3	3 17 0	19 8 0	27 11 0	Do.
Belford	2	1	—	—	5 7 0	Dr. Wilson.
Bellingham	6	4	1 6 0	3 6 0	7 3 0	Do.
Belper	9	4	6 14 0	40 16 0	94 2 0	Mr. Royle.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s. d.	
Berkhampstead	3	3	6 3 0	14 17 0	28 16 0	Mr. Royle.
Berwick-on-Tweed	3	—	—	—	—	Dr. Wilson.
Bideford	6	6	0 16 0	16 19 0	41 0 0	Mr. Royle.
Billericay	4	4	2 9 0	16 16 0	32 15 0	Dr. Bulstrode.
Birkenhead	3	1	—	—	16 10 0	„ Horne.
Birmingham	1	1	—	—	164 3 0	„ Airy.
Bishop Stortford	7	6	1 19 0	10 4 0	28 3 0	Mr. Royle.
Blackburn	9	7	4 18 0	56 13 0	132 13 0	„ Evans.
Blean	4	4	4 4 0	13 0 0	36 6 0	Dr. Sweeting.
Blofield	3	3	1 5 0	11 3 0	18 11 0	„ Airy.
Bootle	3	1	—	—	4 19 0	„ Horne.
Brampton	1	—	—	—	—	Do.
Brecknock	3	3	7 5 0	18 18 0	36 2 0	Mr. Evans.
Brentford	9	8	9 16 0	37 6 0	180 6 0	„ Royle.
Bridge	5	3	3 6 0	9 18 0	19 7 0	Dr. Sweeting.
Bridgwater	10	5	2 4 0	8 15 0	21 17 0	„ Horne.
Bristol	1	1	—	—	8 18 0	„ Airy.
Bromley	7	5	2 19 0	23 2 0	56 2 0	„ Sweeting.
Buckingham	3	2	5 0 0	9 12 0	14 12 0	Mr. Royle.
Builth	1	—	—	—	—	Mr. Evans.
Bury	6	5	3 11 0	17 7 0	57 1 0	Do.
**Camberwell*	5	1	—	—	55 5 0	Dr. Sweeting.
Canterbury	1	1	—	—	26 19 0	Do.
Cardigan	3	2	11 3 0	11 13 0	22 16 0	Mr. Evans.
Carlisle	5	3	3 0 0	54 8 0	61 16 0	Dr. Horne.
Carmarthen	6	5	9 1 0	23 2 0	71 18 0	Mr. Evans.
Castle Ward	7	2	5 9 0	31 4 0	36 13 0	Dr. Wilson.
Chapel-en-le-Frith	3	3	5 13 0	22 0 0	45 5 0	Mr. Royle.
Chard	7	6	2 12 0	11 3 0	40 8 0	Dr. Horne.
Chelmsford	9	7	3 5 0	13 16 0	53 12 0	„ Bulstrode.
Chertsey	5	5	2 12 0	18 6 0	52 5 0	Mr. Royle.
Chester	3	1	—	—	68 11 0	Dr. Horne.
Chesterfield	11	11	9 5 0	53 12 0	328 17 0	Mr. Royle.
Chorlton	13	12	1 11 0	50 9 0	261 11 0	„ Evans.
Clutton	5	2	3 12 0	12 1 0	15 13 0	Dr. Horne.

* Inspected in 1893.

App. A. No. 2.

Inspection of Public Vaccination, 1894.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.		Total Sum awarded in each Union.	Medical Inspector.
			Minimum.	Maximum.		
			£ s. d.	£ s. d.	£ s. d.	
Cockermouth	5	4	4 1 0	40 9 0	92 2 0	Dr. Horne.
Colchester	1	1	—	—	47 0 0	Dr. Bulstrode.
Congleton	3	2	7 15 0	35 19 0	48 14 0	Dr. Horne.
Coventry	1	1	—	—	1 15 0	„ Airy.
Cranbrook	6	3	3 1 0	4 2 0	10 4 0	„ Sweeting.
Crediton	11	7	1 15 0	12 0 0	38 4 0	Mr. Royle.
Crickhowell	2	2	8 6 0	61 3 0	69 9 0	„ Evans.
Croydon	6	5	5 17 0	104 11 0	170 6 0	„ Royle.
Dartford	6	3	20 17 0	38 2 0	84 7 0	Dr. Sweeting.
Derby	2	—	—	—	—	Mr. Royle.
Dorking	4	2	6 6 0	9 9 0	15 15 0	Do.
Dover	4	3	1 16 0	34 16 0	41 12 0	Dr. Sweeting.
Dulverton	3	2	1 0 0	1 3 0	2 3 0	„ Horne.
Eastry	7	6	2 5 0	23 18 0	59 11 0	Dr. Sweeting.
East Stonehouse	1	1	—	—	17 6 0	Mr. Royle.
East Ward	6	1	—	—	4 11 0	Dr. Horne.
Ecclesall Bierlow	3	3	6 5 0	56 9 0	113 16 0	Do.
Edmonton	14	10	1 3 0	48 1 0	186 19 0	Mr. Royle.
Elham	5	4	6 14 0	26 17 0	55 3 0	Dr. Sweeting.
Epping	8	5	3 18 0	10 10 0	32 17 0	„ Bulstrode.
Epsom	9	4	2 2 0	7 13 0	16 8 0	Mr. Royle.
Eton	8	6	0 19 0	18 12 0	47 9 0	Do.
Exeter	1	1	—	—	15 17 0	Dr. Airy.
Farnham	7	5	1 1 0	35 4 0	68 5 0	Mr. Royle.
Faversham	4	1	—	—	40 7 0	Dr. Sweeting.
Flegg, East and West	4	—	—	—	—	„ Horne.
Frome	5	2	5 8 0	5 10 0	10 18 0	„ Airy.
Fulham	3	3	78 14 0	93 3 0	268 15 0	„ Sweeting.
George's, St.	4	4	1 13 0	47 6 0	80 7 0	Dr. Sweeting.
Giles, St., and St. George, Bloomsbury.	1	1	—	—	19 0 0	Do.
Glendale	6	3	0 14 0	8 3 0	10 10 0	Dr. Wilson.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.		Total Sum awarded in each Union.	Medical Inspector.
			Minimum.	Maximum.		
			£ s. d.	£ s. d.	£ s. d.	
Glossop	1	1	—	—	21 13 0	Mr. Royle.
Godstone	5	4	7 0 0	11 17 0	35 15 0	Do.
Gravesend and Milton	1	1	—	—	21 0 0	Dr. Sweeting.
Greenwich	2	2	49 14 0	103 8 0	153 2 0	Do.
Guildford	9	5	2 8 0	20 10 0	56 15 0	Mr. Royle.
Halifax	9	6	0 14 0	6 2 0	16 4 0	Dr. Horne.
Haltwhistle	4	2	0 8 0	2 1 0	2 9 0	„ Wilson.
Hambledon	5	5	3 0 0	15 17 0	43 6 0	Mr. Royle.
Hatfield	3	1	—	—	6 19 0	Do.
Haverfordwest	4	1	—	—	18 9 0	Mr. Evans.
Hay	3	3	4 19 0	7 18 0	18 10 0	Do.
Hayfield	1	1	—	—	31 5 0	Mr. Royle.
Hemel Hempstead	4	3	4 1 0	10 0 0	20 6 0	Do.
Hendon	6	4	3 3 0	74 16 0	114 11 0	Do.
Hexham	11	4	2 15 0	3 12 0	13 3 0	Dr. Wilson.
Hinckley	5	3	1 0 0	4 13 0	11 15 0	Dr. Fletcher.
Holborn	5	3	18 1 0	30 9 0	73 17 0	„ Sweeting.
Hollingbourn	6	4	3 0 0	4 13 0	14 17 0	Do.
Holsworthy	5	2	4 7 0	5 1 0	9 8 0	Dr. Horne.
Holyhead	3	2	12 9 0	18 2 0	30 11 0	Mr. Evans.
Honiton	12	6	1 15 0	12 9 0	36 7 0	„ Royle.
Hoo	1	—	—	—	—	Dr. Sweeting
Kendal	9	5	2 3 0	5 14 0	20 5 0	Dr. Horne.
Kensington	2	2	15 0 0	104 19 0	119 19 0	„ Sweeting.
Keynsham	1	1	—	—	58 11 0	„ Horne.
Kingsbridge	7	5	4 1 0	13 13 0	36 8 0	Mr. Royle.
Kingston-on-Thames	11	6	1 8 0	39 7 0	65 9 0	Do.
Knighton	5	2	2 16 0	4 17 0	7 13 0	Mr. Evans.
Lampeter	2	2	8 13 0	13 14 0	22 7 0	Mr. Evans.
Lancaster	5	2	3 8 0	66 19 0	90 17 0	Do.
Langport	6	3	1 4 0	8 6 0	14 2 0	Dr. Horne.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.		Total Sum awarded in each Union.	Medical Inspector.
			Minimum.	Maximum.		
			£ s. d	£ s. d.	£ s. d.	
Lexden and Winstree -	10	8	3 3 0	10 16 0	40 16 0	Dr. Bulstrode.
Leyburn - - -	6	2	1 18 0	4 4 0	6 2 0	„ Horne.
Liverpool - - -	3	2	18 16 0	59 8 0	78 4 0	„ Sweeting.
Llandilo Fawr - -	5	4	5 15 0	16 0 0	35 14 0	Mr. Evans.
Llandovery - -	2	2	10 0 0	16 5 0	26 5 0	Do.
Llanelly - - -	3	3	24 14 0	117 13 0	170 7 0	Do.
Loddon and Clavering -	4	3	2 17 0	8 11 0	16 15 0	Dr. Airy.
Longtown - - -	2	1	—	—	8 15 0	„ Horne.
Lunesdale - -	4	3	2 1 0	4 4 0	8 17 0	Mr. Evans.
Lutterworth - -	6	3	3 4 0	8 6 0	16 10 0	Dr. Fletcher.
Macclesfield - -	5	4	4 7 0	69 4 0	101 11 0	Dr. Horne.
Maidstone - -	5	4	7 2 0	33 10 0	61 10 0	„ Sweeting.
Maldon - - -	8	6	2 4 0	11 5 0	37 15 0	„ Bulstrode.
Malling - - -	5	3	10 11 0	14 2 0	38 12 0	„ Sweeting.
Manchester - -	3	3	23 0 0	50 10 0	115 12 0	Do.
Market Bosworth -	6	4	0 16 0	13 11 0	27 6 0	Dr. Fletcher.
Market Harborough -	5	1	—	—	0 4 0	Do.
Medway - - -	3	2	32 14 0	50 14 0	83 8 0	Dr. Sweeting.
Melton Mowbray -	7	4	1 3 0	2 10 0	6 11 0	„ Fletcher.
Milton - - -	2	2	16 3 0	42 1 0	58 4 0	„ Sweeting.
Morpeth - - -	9	3	2 18 0	24 13 0	35 5 0	„ Wilson.
Nantwich - - -	7	3	5 5 0	17 5 0	29 0 0	Dr. Horne.
Narberth - - -	4	4	10 7 0	14 2 0	49 10 0	Mr. Evans.
Newcastle-in-Emlyn -	3	2	12 9 0	20 10 0	33 8 0	Do.
Newcastle-on-Tyne -	3	4	23 18 0	61 13 0	151 5 0	Dr. Airy.
Newport Pagnell - -	10	6	1 8 0	11 3 0	35 6 0	Mr. Royle.
Newton Abbot - -	12	6	3 19 0	26 19 0	63 8 0	Dr. Horne.
North Bierley - -	14	6	2 17 0	11 3 0	44 4 0	Do.
Northwich - -	5	4	29 6 0	48 16 0	149 4 0	Do.
Norwich - - -	2	1	—	—	21 18 0	Dr. Airy.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union. Minimum.	Range of Awards in each Union. Maximum.	Total Sum awarded in each Union.	Medical Inspector.
			£ s. d.	£ s. d.	£ s d.	
Oakham - - -	3	3	3 9 0	12 0 0	19 3 0	Dr. Bulstrode.
Okehampton - -	6	4	2 5 0	11 9 0	24 9 0	„ Horne.
Olave, St. - - -	3	3	23 5 0	55 1 0	123 17 0	„ Sweeting.
Oldham - - -	6	3	0 17 0	1 16 0	3 19 0	Mr. Evans.
Ongar - - -	4	3	3 16 0	5 17 0	14 12 0	Dr. Bulstrode.
Orsett - - -	5	4	4 2 0	13 14 0	30 1 0	Do.
Paddington - -	1	1	—	—	94 1 0	Dr. Sweeting.
Pembroke - - -	6	4	6 18 0	26 17 0	58 15 0	Mr. Evans.
Penistone - - -	3	3	4 0 0	17 5 0	28 13 0	Dr. Horne.
Penrith - - -	6	4	2 3 0	5 1 0	15 19 0	Do.
Plymouth - - -	1	1	—	—	47 1 0	Do.
Plympton St. Mary -	5	3	7 3 0	9 2 0	23 10 0	Do.
Pontardawe - -	2	2	43 14 0	50 17 0	94 11 0	Mr. Evans.
Poplar - - -	4	4	26 19 0	110 11 0	252 14 0	Dr. Sweeting.
Prescot - - -	6	3	6 8 0	119 4 0	192 11 0	Mr. Thompson.
Prestwich - - -	6	4	6 11 0	71 12 0	169 4 0	Dr. Wilson.
Reeth - - -	2	2	3 16 0	5 2 0	8 18 0	Dr. Horne.
Reigate - -	4	3	2 18 0	13 14 0	22 1 0	Mr. Royle.
Rhayader - - -	2	1	—	—	9 16 0	„ Evans.
Richmond (Surrey) -	3	2	5 17 0	39 0 0	44 17 0	„ Royle.
Richmond (Yorks) -	5	4	2 11 0	9 10 0	22 14 0	Dr. Horne.
Rochdale - - -	6	3	2 11 0	72 3 0	88 0 0	Mr. Evans.
Rochford - - -	6	4	3 1 0	16 10 0	32 6 0	Dr. Bulstrode.
Romford - - -	6	4	1 16 0	29 2 0	72 0 0	Do.
Romney Marsh - -	3	3	0 13 0	6 18 0	12 16 0	Dr. Sweeting.
Rothbury - - -	6	3	0 6 0	3 6 0	6 1 0	„ Wilson.
Rotherham - -	8	4	4 1 0	24 18 0	46 16 0	„ Horne.
Runcorn - - -	4	2	7 17 0	55 9 0	63 6 0	Do.
Salford - - -	4	2	11 9 0	39 12 0	51 1 0	Dr. Sweeting.
Saviour, St. - -	5	5	35 19 0	66 0 0	262 8 0	Do.
Settle - - -	4	2	7 12 0	9 9 0	17 1 0	Dr. Horne.
Sevenoaks - - -	6	5	3 15 0	9 7 0	35 14 0	„ Sweeting.
Shardlow - - -	8	7	5 15 0	55 1 0	129 7 0	Mr. Royle.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.		Total Sum awarded in each Union.	Medical Inspector.
			Minimum.	Maximum.		
			£ s. d.	£ s. d.	£ s. d.	
Sheppey	2	2	8 2 0	29 2 0	37 4 0	Dr. Sweeting.
Shepton Mallet	5	1	—	—	1 11 0	„ Horne.
South Molton	9	4	4 15 0	10 7 0	26 12 0	Mr. Royle.
Staines	7	4	2 3 0	11 2 0	26 6 0	Do.
Stepney	1	1	—	—	78 18 0	Dr. Sweeting.
Stoke Damerel	2	2	28 12 0	31 5 0	59 17 0	„ Royle.
Strand	1	1	—	—	13 16 0	Dr. Sweeting.
Strood	2	2	30 13 0	52 4 0	82 17 0	Do.
Swansea	5	5	35 9 0	106 3 0	374 18 0	Mr. Evans.
Tarvin	3	3	8 7 0	16 4 0	39 13 0	Dr. Horne.
Taunton	7	4	4 6 0	8 12 0	24 4 0	Do.
Tavistock	8	5	3 16 0	17 3 0	37 11 0	Do.
Tendring	9	7	1 15 0	21 9 0	59 8 0	Dr. Copeman.
Tenterden	6	3	1 5 0	3 8 0	7 12 0	„ Sweeting.
Thanet, Isle of	4	3	9 4 0	32 10 0	51 10 0	Do.
Thomas St.	15	14	0 17 0	24 13 0	88 15 0	Mr. Royle.
Tiverton	13	8	0 16 0	9 15 0	34 10 0	Do.
Tonbridge	6	4	5 4 0	10 15 0	31 5 0	Dr. Sweeting.
Torrington	5	5	4 4 0	11 16 0	31 16 0	Mr. Royle.
Totnes	13	6	1 17 0	18 1 0	43 1 0	Dr. Horne.
Toxteth Park	2	2	21 16 0	39 15 0	61 11 0	„ Sweeting
Tregaron	2	2	6 4 0	17 11 0	23 15 0	Mr. Evans.
Tynemouth	7	4	15 8 0	46 16 0	125 6 0	Dr. Wilson.
Ulverston	7	7	4 10 0	26 14 0	83 1 0	Mr. Evans.
Uppingham	4	1	—	—	8 14 0	Dr. Bulstrode.
Uxbridge	7	6	2 2 0	13 15 0	44 0 0	Mr. Royle
Wellington (Som.)	5	3	4 8 0	9 13 0	19 3 0	Dr. Horne.
Wells	4	3	5 18 0	9 16 0	24 15 0	Do.
Welwyn	1	1	—	—	3 1 0	Mr. Royle.
West Derby	7	6	14 7 0	89 17 0	251 5 0	Dr. Sweeting.
Westminster	1	—	—	—	—	Do
West Ward	4	3	2 8 0	3 0 0	7 18 0	Dr. Horne.

UNION.	No. of Vaccination Districts in the Union.	No. of Public Vaccinators recommended for Award.	Range of Awards in each Union.						Total Sum awarded in each Union.			Medical Inspector.
			Minimum.			Maximum.						
			£	s.	d.	£	s.	d.	£	s.	d.	
Whitechapel	1	1	—			—			197	1	0	Dr. Sweeting.
Whitehaven	6	5	21	16	0	44	2	0	141	7	0	„ Horne.
Wigton	6	4	3	9	0	9	7	6	27	11	0	Do.
Williton	7	6	1	0	0	10	10	0	26	18	0	Do.
Wincanton	6	5	3	7	0	6	18	0	24	7	0	Do.
Winslow	3	2	3	9	0	6	0	0	9	9	0	Mr. Royle.
Wirrall	4	2	7	17	0	14	4	0	22	1	0	Dr. Horne.
* *Woodstock*	4	1	—			—			7	19	0	Mr. Royle.
Wortley	4	2	3	15	0	36	13	0	40	8	0	Dr. Horne.
Yarmouth, Great	2	2	20	7	0	44	10	0	64	17	0	Dr. Airy.
Yeovil	7	6	3	1	0	12	18	0	41	7	0	„ Horne.
Total	1,170	785	—			—			12,171	9	0	

* Inspected in 1893.

No. 3.

STATISTICS OF THE NATIONAL VACCINE ESTABLISHMENT AND EDUCATIONAL VACCINATION STATIONS.

I.—STAFF AT END OF 1894.

N.B.—The Stations named in *italics* are Educational Vaccination Stations authorised by the Local Government Board.

Description of Vaccinator.	Name of Vaccinator.	Vaccination Stations.	Days and Hours of Attendance.
Vaccinators supplying lymph for the public service and salaried from the Parliamentary grant.	1. Dr. R. Cory	*Surrey Chapel*	Tues., Thurs.; 2.
	2. Mr. Joseph Loane	*Tottenham Court Chapel.*	Mon., Wednes.; 1.
Parochial and other Vaccinators not salaried from the Parliamentary grant, but contributing lymph at a fixed rate of payment.	1. Dr. A. C. Clarke	*Salford*	Thursday; 2.
	2–6. Dr. Edmund Robinson.	*Birmingham*	Monday Tuesday Wednesday; 11. Wednesday; 2 Thursday; 11.
	7. Mr. N. E. Roberts	*Liverpool*	Tuesday; 1.
	8. Mr. E. L. Webb	*Pimlico*	Thursday; 10.
	9. Mr. J. Hawthorn	*Newcastle-on-Tyne.*	Wednesday; 3.
	10. Mr. E. L. Webb	Westminster	Tuesday; 10.
	11–12. Mr. E. C. Greenwood	*Marylebone*	Tuesday; 2. Wednesday; 10.
	13. Mr. J. Loane	*Whitechapel*	Wednesday; 11.
	14. Mr. Frederick Holmes	*Leeds*	Tuesday; 2.30.
	15. Dr. Edward Lynes	Coventry	Tuesday; 12.
	16–17. Dr. Hugh Thomson	*Glasgow*	Monday; 2. Mon., Thurs.; 12.
	18. Mr. J. F. Staines	*Endell Street*	Tuesday; 10.
	19. Mr. W. Skinner	*Sheffield*	Tuesday; 3.
	20. Dr. G. A. Miskin	Waterloo	Tuesday; 2.
	21. Dr. J. B. Buist	*Edinburgh*	Thursday; 3.
	22. Dr. R. Cory	*St. Thomas's Hosp.*	Wednesday; 11.30.
	23. Mr. Wm. McLennan	*Glasgow West*	Monday; 1.
	24. Dr. William A. Budd	*Exeter*	Thursday; 3.
	25. Mr. R. G. McKerron	*Aberdeen*	Wednesday; 2.30.
Teachers of Vaccination not supplying lymph.	Dr. W. Husband	*Edinburgh*	Wednes., Sat.; 12.
	Mr. H. Lawrence	*Bristol*	Wednesday; 10.
	Mr. V. A. Jaynes	*Horsleydown*	Wednesday; 3.
	Dr. A. N. Montgomery	*Dublin*	Tues., Fri.; 10.
	Dr. R. Cory	*Cambridge*	Friday; 11.

II.—ANIMAL VACCINE STATION.

The ANIMAL VACCINE STATION is at 95, LAMB'S CONDUIT STREET, where DR. R. CORY and MR. T. S. STOTT attend for the Vaccination of Children on TUESDAYS and THURSDAYS, at 10.30 a.m.

III.—SOURCES AND AMOUNT OF LYMPH SUPPLY IN 1894.

N.B.—The Stations named in *italics* are Educational Vaccination Stations authorised by the Local Government Board.

Description of Vaccinator.	Vaccination Stations.	Number of Vaccinations performed at the Stations respectively.		Number of Charges of Lymph supplied from the Stations respectively.	
		Primary.	Re-vaccinations.	Charged Ivory Points.	Charged Tubes each estimated as equal to 10 Ivory Points.
Vaccinators salaried from the Parliamentary grant.	1. *Surrey Chapel*	158	11	273	—
	2. *Tottenham Court Chapel.*	291	8	—	130
	Total -	449	19	273	130
Parochial and other Vaccinators not salaried from the Parliamentary grant, but contributing lymph at a fixed rate of payment.	1. *Salford* - -	209	—	—	—
	2–6. *Birmingham* -	4,227	10,135	—	653
	7. *Liverpool* -	586	101	—	380
	8. *Pimlico* - -	338	13	—	47
	9. *Newcastle on-Tyne.*	509	12	—	89
	10. Westminster -	433	13	—	48
	11–12. *Marylebone*	2,542	2,332	—	40
	13. *Whitechapel* -	1,924	—	—	728
	14. *Leeds* - -	682	2	—	—
	15. Coventry -	40	3	—	—
	16–17. *Glasgow* -	1,149	—	—	—
	18. *Endell Street* -	162	26	—	118
	19. *Sheffield* - -	623	1	—	7
	20. Waterloo -	1,262	2	—	1,667
	21. *Edinburgh* -	362	462	—	—
	22. *St. Thomas's Hospital.*	195	3	—	—
	23. *Glasgow West* -	611	7	—	—
	24. *Exeter* - -	539	6	—	11
	25. *Aberdeen** -	56	—	—	—
	Total -	16,449	13,121	—	3,788
	Grand Total -	16,898	13,140	273	3,918

* For two months only.

III.—SOURCES AND AMOUNT OF LYMPH—*continued.*

During the year, additional supplies (to the extent of 4,860 charged tubes) were obtained from the following gentlemen:—

Mr. J. Bark, Kirkdale.
Dr. F. Cadell, Edinburgh.
Dr. R. F. Cook, Gateshead.
Mr. H. E. Hackett, Gorton.
Mr. J. B. Mann, Manchester.
Mr. A. Meeson, Toxteth Park.
Dr. G. A. Miskin, Kennington.
Dr. J. Prytherch, Liverpool.

IV.—DISTRIBUTION OF HUMAN LYMPH, 1894.

Number of applications:	
From Medical Practitioners in England and Wales	3,397
" " " Scotland	102
" the Navy and from the Emigration Department	48
" India and the Colonies	37
" Diplomatic and other Foreign Services	17
Supplies sent out:—	
Charged ivory points	224
" capillary tubes	6,878

V.—DISTRIBUTION OF CALF-LYMPH, 1894.

Number of applications	2,117
Supplies received:—	
Charged ivory points	14,654
" capillary tubes	78
Supplies sent out:—	
Charged ivory points	14,029
" capillary tubes	78

On the Operations of the Animal Vaccine Establishment, 1894 95; by Dr. Cory.

No. 4.

Report on the Operations of the Animal Vaccine Station, at Lamb's Conduit Street, during the year 1894–95; by Dr. Cory.

During the year, 1st April 1894 to 31st March 1895, 269 calves were received at Lamb's Conduit Street. Of these, 266 (males 158, females 108) were vaccinated for the purposes of the station; other three were rejected as unfit for vaccination purposes.

The aggregate weight on reception at Lamb's Conduit Street of the 266 calves was 47,394 lbs. male, 32,120 lbs. female. On dismissal from the station their weights were respectively 50,758 lbs. and 34,896 lbs., so that during retention for vaccination purposes calves of both sexes gained considerably in weight, males by an average of 21·29 lbs.; females by an average of 25·7 lbs.

Of the above calves 263 were vaccinated with lymph directly derived from other calves, and three were vaccinated with calf lymph which had been stored. Vaccinations performed with stored lymph proved much less successful than the others. Insertions to the number of 19,117 in 263 calf-to-calf operations produced 18,084 vesicles, a rate of insertion success of 94·6 as against 68·09 per cent. in operations with stored lymph. No material difference in the results of calf-to-calf vaccinations was observed whether the lymph used was from calves vaccinated 96, or from calves vaccinated 120 hours previously; in both cases the rate of insertion success was practically 94·6 per cent.

Primary Vaccinations.—During the year 7,202 persons received primary vaccination at the station, five separate insertions of lymph being made in each instance. Of these persons, 3,624 were males and 3,578 females. All but 31 of the 7,058 primary vaccinations of persons who returned for inspection succeeded at the first attempt, and in no case was a third attempt at vaccination requisite. The amount of insertion success obtained by each of three several operators was as follows. Of 39 persons primarily vaccinated by Mr. Stott, 37 were on examination found to have taken in five places, and two in two. Mr. Stott's insertion success rate, therefore, was 96·92 per cent.

Of 955 persons primarily vaccinated by Dr. Savory, acting for Mr. Stott or myself in the absence of one or other of us, 33 failed to return for inspection, and one was vaccinated round a nævus for its cure. Of the remaining 921, 776 were found to have taken in five places, 74 in four, 35 in three, 19 in two, 11 in one, and in 6 vaccination failed at the first attempt. Dr. Savory's success, therefore, was 94·03 per cent.

Of 6,317 persons primarily vaccinated by myself, 111 who failed to return for inspection and other 6, all of whom were operated on for the cure of nævi, are not taken into account in these statistics. Of the 6,200 remaining, 5,758 were found to have taken in five places, 230 in four, 91 in three, 67 in two, 31 in one only, while in 23 cases vaccination proved unsuccessful on the first trial—an insertion success rate of 97·25 per cent.

Re-vaccinations.—These, during the year, numbered 606. Dr. Savory performed 77, students performed 9, and I myself 520. Of these latter, 456 were successful in five places, 25 in four, 10 in three, 5 in two, 5 in one, and 3 were unsuccessful at the first trial, and other 16 did not return for inspection. My insertion success rate, therefore, in re-vaccination was 96·23 per cent. Dr. Savory's success rate among his cases which returned for inspection was 95·95 per cent.

In all, 65 cases returned to the station after "inspection" on account of some abnormal course of their vaccination. In the majority of cases (53) the abnormality consisted of sore arm, which was almost invariably the result of ignorant treatment of the vesicles or of the scabs. For the rest there were eight cases of transient eruption, two cases of axillary abscess (both following sore arms), and two cases of erysipelas (also complicating sore arm).

No. 5.

App. A. No. 5.

Abstract of Medical Inspections.

ABSTRACT of MEDICAL INSPECTIONS made in 1894 with regard to the INCIDENCE of DISEASE on particular places, and to questions concerning LOCAL SANITARY ADMINISTRATION.

1. BARNHAN BROOM (NORFOLK); population of parish (1891), 412; Mr. T. W. Thompson.

Sanitary Authority: Forehoe Rural.

Ground of Inquiry: Diphtheria. Application from Rural Sanitary Authority for assistance.

Chief Facts reported by Inspector: Somewhat high diphtheria death-rate in the Forehoe Rural District for decennium 1881-90; but decided abatement during the year next succeeding. Complete immunity of Barnham Broom itself for considerable period prior to outbreak in question. This commenced in part of village known as Pockthorpe, about beginning of May 1894, and continued to date of inquiry (September 18th, 1894), by which time over 60 cases of diphtheria or of suspicious throat illness, and 11 deaths, had resulted. Origin of outbreak doubtful. Evidence as to importation by human agency not conclusive. Suspicious ailment among cows and cats at farm supplying milk to Pockthorpe possibly related to inception of human diphtheria. Subsequent dissemination of disease in great measure due to unrestrained communication between sick and healthy. School attendance not largely responsible for its spread. Measles widely prevalent in village shortly prior to outbreak of diphtheria.

No provision made for proper isolation of the sick or for efficient disinfection of infected articles.

Cottage accommodation, water supply, and arrangements for excrement disposal in some cases highly unsatisfactory.

Surface drainage of Pockthorpe defective, conducing to dampness of locality.

2. BARNSTAPLE, BIDEFORD, AND ILFRACOMBE URBAN, AND BARNSTAPLE AND BIDEFORD RURAL DISTRICTS (DEVON); population (1891), 54,974; Dr. Reece.

Sanitary Authorities: Barnstaple, Bideford, and Ilfracombe Urban, and Barnstaple and Bideford Rural.

Ground of Inquiry: Continued prevalence of diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: Diphtheria present in Barnstaple Rural District since 1884, becoming epidemic in Barnstaple and Ilfracombe Urban Districts in 1893. In the area of the five districts under consideration, 89 deaths occurred in 1893 and first five months of 1894; of which 47 occurred in the Barnstaple Urban District. The number of cases of disease in this district unknown, the Infectious Disease (Notification) Act, 1889, not being in operation. Disease spread mainly by school attendance and by personal contact. General prevalence of sore throat; some scarlet fever.

Want of proper hospital accommodation and of efficient disinfecting apparatus.

(*a.*) **Barnstaple Urban District**; population (1891), 13,058. The Infectious Disease (Notification) Act, 1889, and the Infectious Disease (Prevention) Act, 1890, not adopted. In 17 months (January 1893–May 1894, inclusive), 47 deaths from diphtheria; attacks during same period probably exceeded 200. First cases appeared in Wesleyan Schools, which were promptly closed; in all, 75 cases referred to these schools. Another series of cases apparently unconnected with schools.

Hospital accommodation unsuitable, and not now used. Disinfecting apparatus open to serious objection. Disinfection of infected premises inadequately carried out.

Sewerage system and house drainage defective in places. No flushing of branch sewers, except by surface water. Insufficient flushing of many w.c.'s.

(*b.*) **Bideford Urban District**; population (1891), 7,831. In 1893, 11 diphtheria cases notified and four deaths; six cases and one death in 1894 to the end of May. One outbreak traced to importation from London; single cases to importation from the Northam Urban District and Instow (in the Barnstaple Rural District). Other cases not traced to infection from previous cases. In each instance defective drains and insanitary w.c.'s were discovered.

Hospital provided. Kept ready for use; defective, however, in construction. No disinfecting apparatus. The Authority provide disinfectants, and disinfect houses (sulphur fumigation) free of charge.

Catch-pits on the line of sewers; rapid and complete removal of the sewage from the neighbourhood of houses thus prevented. Flushing inefficient. House drainage defective.

(*c.*) **Ilfracombe Urban District**; population, 7,692 in 1891. In 1893, 11 diphtheria cases notified (4 deaths); 46 cases notified in first five months of 1894 (9 deaths). The disease apparently not spread by school attendance or by milk supply. Certain cases traced to personal infection. Dr. Copner infected from a patient and died. Four nurses attacked at Burrow House Hospital for infectious disease. This hospital is the wing of a private house unsuited for the purpose. A second hospital, an adapted farmhouse at Mullacott, 3 miles from Ilfracombe, is not used. No disinfecting apparatus. Infected articles placed in an airtight chamber, and treated to sulphur fumigation, then exposed to sunlight and air for some days.

Sewerage system defective in places, and owing to building progressing, now in need of extension. Ventilation and flushing not efficient in all sewers. House drainage in older houses direct to sewers, and unventilated.

(*a.*) **Barnstaple Rural District**; population (1891), 19,071. Diphtheria not absent from the district since 1884; 91 deaths in the 10 years ending December 1893. Notifications, 23, deaths, 8, in first five months of 1894. Disease widely distributed. Sore throats prevalent.

No hospital or proper disinfecting apparatus established by the Rural Authority. In many instances disinfection of infected premises and articles of clothing left to the inhabitants. Three inspectors of nuisances, each holding several other appointments.

Several villages are being sewered: in those not sewered many houses drain to cesspools. Excrement of nine-tenths of population disposed of by privies. The duty of cleaning out and emptying privies, and removing house refuse, is left to the householder.

(e.) BIDEFORD RURAL DISTRICT; population (1891), 7,322. Six notifications of diphtheria and one death in 1893, and six notifications and two deaths in the first five months of 1894. Chief incidence of disease on the village of Clovelly. Spread by personal infection.

No hospital or proper disinfecting apparatus established by the Rural Authority. The Infectious Disease (Prevention) Act, 1890, not adopted. Disinfectants supplied gratis when applied for. Disinfection of house premises and clothes not necessarily carried out by inspector of nuisances, and therefore liable to be imperfectly performed. Two or three inspectors required for district to properly carry out necessary work.

The sewering of villages is progressing. Excrement disposal mainly by midden privies. Scavenging done by occupiers. Refuse used on fields and gardens.

3. BROADSTAIRS (KENT); population (1891), 5,525; Dr. Bruce Low.

Sanitary Authority: Broadstairs Urban.

Ground of Inquiry: Diphtheria. Registrar-General's Returns.

Chief Facts reported by Inspector: Prevalence of diphtheria in the early part of 1894 chiefly in outlying rural and semi-rural parts of district. Diffusion of the disease associated with school attendance. No connexion traced between the disease and drainage or excrement disposal. In summer months a small localised outbreak occurred in a convalescent home, traced to direct importation of infection from London. Majority of cases removed to hospital with good results in limiting spread of the disease. Outbreaks in previous years at Broadstairs in other convalescent homes due to persons coming from London suffering from mild attacks or incubating the disease.

4. BROMLEY AND BECKENHAM JOINT HOSPITAL DISTRICT (KENT); population (1891), 69,253; Mr. T. W. Thompson.

Sanitary Authorities: The Bromley and Beckenham Joint Hospital Board (the Bromley Urban, the Beckenham Urban, and the Bromley Rural).

Ground of Inquiry: Alleged re-introduction of scarlatina into households by patients discharged as cured from the Bromley and Beckenham Joint Hospital.

Chief Facts reported by Inspector: Inspector gives account of a series of conferences, attended by him, between representatives of the Authorities above named; and discusses in detail a number of considerations seen to be arising in reference to the evidence adduced at these conferences and to other facts in this connexion. (*See* page 103 of present volume.)

5. BURY (LANCS.); population (1891), 57,206; Dr. S. Monckton Copeman.

Sanitary Authority: Bury Town Council.

Ground of Inquiry: Prevalences of "fever." Registrar General's Returns.

Chief Facts reported by Inspector: Sudden rise in number of notified cases of "continued fever" during third quarter of 1894, of which abnormal proportion proved fatal. In these cases, as well as in others notified as enteric fever, the malady was in reality typhus. The disease was largely spread by personal intercourse.

Sanitary condition of invaded areas decidedly faulty. Large number of privy-middens in district. Overcrowding prevalent, and many houses built "back-to-back" or without provision for "through" ventilation. Hospital provided for infectious cases, but structural arrangements unsatisfactory, and nursing staff inefficient.

6. **Crofton, Hamlet of (Kent)**; Dr. Copeman.

Sanitary Authority: Bromley Rural.

Ground of Inquiry: Diphtheria. Local representations.

Chief Facts reported by Inspector: Localised outbreak confined to four houses in the hamlet. Diphtheria previously unknown there.

Water supply good, except in one instance; this remedied since. "Bexley" system in operation for removal of excrement and liquid refuse; a number of the cesspools draining to small brook. Soil impervious and water-logged.

"London manure" extensively used in neighbourhood.

7. **Desborough (Northants)**; population (1891), 2,872; Dr. Fletcher.

Sanitary Authority: Desborough Urban.

Ground of Inquiry: Enteric fever; persistent for some years past. Reports of Medical Officer of Health.

Chief Facts reported by Inspector: Outbreak of enteric fever in 1890, developing into an epidemic during that year and the first part of 1891, since which time the disease has been more or less endemic. Fever death-rate (mean annual) for the two years 1890–91, 3·80 per 1,000, as against 0·17 for England and Wales during the same period. No public water supply. Water obtained from upwards of 230 shallow wells, sunk in porous soil, and liable in many cases to pollution from various sources. Neglect by the Authority; non-adoption of compulsory notification, non-provision of isolation hospital, &c.

8. **Durham, County of**; population (1891), 1,024,372; Mr. T. W. Thompson.

Sanitary Authorities: The 29 urban and 14 rural authorities within the county.

Ground of Inquiry: Exceptional prevalence of enteric fever in certain areas within the county.

Chief Facts reported by Inspector: Enteric fever, which the Registrar-General has shown to have been for some years unduly prevalent along the eastern side of the county of Durham and in adjacent areas in the counties of Northumberland and North Yorkshire—a region corresponding to 18 Registration Districts—became conspicuously prevalent over that region, as indicated by "fever" mortality, during the year 1893. Unusual prevalence there also, during 1893, of fatal diarrhœa. No sufficient grounds, judging from seasonal distribution of "fever" and diarrhœa deaths in the county of

Durham, for regarding this fatal diarrhœa as having consisted largely of unrecognised enteric fever, but some statistical suggestion as to possible relationship between the prevalence of the two diseases.

Exceptional prevalence of enteric fever in Durham county during 1893 to be regarded, firstly, as local expression of exceptional prevalence of the disease during that year in England and Wales generally, and, secondly, as local expression of its already established extra prevalence over the Registrar-General's 18 Registration Districts.

General prevalence of enteric fever in Durham county during 1893 not, so far as evidence was obtained, to be largely accounted for by contamination of milk supplies. Influence of contaminated water supplies a more complex problem. Although water may, by reason of independent contamination of multiple supplies, have played no small part in the epidemic spread of the fever at different times and places within the county of Durham, no sufficient explanation is hereby afforded of the widespread and sustained prevalence of the disease there. Inference that some other important factors have contributed, and perhaps largely contributed, to the prevalence in question.

9. HASTINGS REGISTRATION DISTRICT (SUSSEX); population (1891), 63,466; Dr. Bruce Low.

Sanitary Authorities: Hastings Town Council and Rural Authority.

Grounds of Inquiry: Diphtheria and small-pox. Registrar-General's Returns and information from other sources.

Chief Facts reported by Inspector: (*a*.) HASTINGS BOROUGH.—General prevalence of diphtheria in the borough during last three or four years (from 1890 to 1893), different parts of Hastings being affected at various times. No great outbursts, but continued smouldering of the disease, associated, in 1893, with epidemic of scarlatina. Evidence of frequent importations of diphtheria into Hastings by visitors. Groups of diphtheria cases traced to infection conveyed by convalescent scarlatina patients from borough sanatorium to their homes. Main factor of diphtheria appears to have been diffusion of the infection by mild and unrecognised cases. Type of the disease generally mild; no association of the ailment observable with water supply, sewerage, or excrement disposal.

Small-pox brought to Hastings in January 1893 by a traveller from Oldham; case removed, at once, along with others which occurred subsequently, to a separate iron pavilion in sanatorium grounds, situated just outside the borough boundary. From this building, early in March, it was recognised that small-pox was being spread to surrounding houses, including the sanatorium proper and the workhouse. Of 86 cases noted, 9 died. Vaccination and re-vaccination practised freely, with good results. Some difficulty experienced in diagnosing modified small-pox in vaccinated subjects.

(*b*.) HASTINGS RURAL DISTRICT.—Prevalence of diphtheria since 1890 confined mostly to Silverhills and Ore, practically continuous with borough of Hastings. Concurrent prevalence of scarlatina in 1893; disease diffused by personal communication with previous cases; no association of diphtheria with water supply, drainage, or excrement disposal.

Abstract of Medical Inspections.

Small-pox introduced (as above stated) in 1893 into Ore in vicinity of the borough sanatorium; evidence of aërial convection of small-pox infection from the iron pavilion to adjacent houses, including workhouse. After removal of the small-pox cases from the sanatorium to a field hospital at Ore Villa Farm the disease subsided. Vaccination and re-vaccination practised with good results.

10. HINCKLEY REGISTRATION DISTRICT (LEICESTER); population (1891), 20,699; 'Dr. S. W. Wheaton.

Sanitary Authorities: Hinckley Urban and Rural.

Ground of Inquiry: Continued prevalence of diphtheria, since previous report of 1893.

Chief Facts reported by Inspector: (*a.*) HINCKLEY URBAN DISTRICT.— From January 1st, 1893, to November 30th, 1894, 116 deaths from diphtheria occurred within the district. In this period the disease continued to be confined to the children of the working classes. Further exemption of the children in the workhouse in the town, who attend school at a neighbouring village. Disappearance during spring of 1894 of sore throat and associated affections of mucous surfaces mentioned as prevalent in former report; with the exception of nasal catarrh, which was still very prevalent among younger children attending school, and was of possibly contagious character.

Improvements in sewerage, and, to a smaller extent, in method of excrement disposal, since former visit. Removal of some nuisances, and improvement of bakehouses. No isolation provision for cases of diphtheria; disinfection very imperfectly carried out. Very little action taken for improvement of house drainage and of unwholesome dwellings.

Infectious Disease (Notification) Act, 1889, adopted, and came into force August 13th, 1894, between which date and November 30th, 1894, 143 cases of diphtheria were notified to the Authority.

(*b.*) HINCKLEY RURAL DISTRICT.—In the 12 months ending November 28th, 1894, 62 deaths from diphtheria occurred in the district, and 267 cases of diphtheria notified to the Authority during the same period, under the provisions of the Infectious Disease (Notification) Act, 1889. In some villages in which diphtheria prevailed at the time of the former report, the disease had died out, whilst other villages in the district had become invaded by the disease. The affections of the throat, nose, and mouth, prevalent at the time of the former report in villages where diphtheria was present, had disappeared from those villages; but diphtheria had continued to prevail in some of them. On the other hand, these affections, accompanied by nasal catarrh, were still present among children in certain villages in the district in which diphtheria had recently made its appearance, and in which outbreaks of the disease were in progress. At Stony Stanton, where a severe outbreak of diphtheria was recorded in the former report, but from which village diphtheria had now been absent for some months, the children attending the schools appeared to be entirely free from sore throat and associated affections of mucous membranes, and from nasal catarrh also. The close connexion between these affections of throat, nose, and mouth and diphtheria more definitely indicated by this further history of the prevalence of diphtheria in the Hinckley districts; as also the untoward significance of a plurality of cases of nasal catarrh among children during a time of diphtheria prevalence.

No isolation provision for cases of diphtheria; no efficient disinfection of clothing or bedding; no arrangements for notifying to teachers the presence of diphtheria in families from which children were attending school. Very little change in the sanitary condition of the district since the last inspection.

11. Hucknall Torkard (Notts); population (1891), 13,094; Dr. Horne.

Sanitary Authority: Hucknall Torkard Urban.

Ground of Inquiry: Scarlatina. Registrar-General's Returns and local representations.

Chief Facts reported by Inspector: Scarlatina endemic since 1887, the disease assuming epidemic form in 1893. Exceptionally high rate of mortality from the malady, viz., 5·3 per 1,000 of estimated population. Marked incidence of the disease upon young children. Actual number of non-fatal cases of scarlatina unascertainable. Intercourse between healthy and infected persons obviously answerable for spread of infection. Attendance of children at elementary schools largely operative in the spread of scarlatina. Neither the Infectious Disease (Notification) Act, 1889, nor any parts of Infectious Disease (Prevention) Act, or the Public Health Acts Amendment Act, 1890, adopted in the district. Existence of dangerous nuisances. No means available for the isolation of cases of infectious disease. Scanty supervision of infected persons or premises by the Authority. Absence of useful attempts at disinfection. Closure of elementary schools not recommended.

12. Hythe and Bramshaw Villages (Hants); population (1891), 1,426; Dr. Bulstrode.

Sanitary Authority: New Forest Rural.

Ground of Inquiry: Diphtheria. Local representations.

Chief Facts reported by Inspector: Between January 14th and February 1st there occurred, in and around Hythe, 21 cases of diphtheria. Disease in the first instance probably introduced from without; subsequent spread in the main due to the aggregation of children at a concert, and to the impossibility of isolating the patients in their own homes. The attacks were distributed among eight families, the number per house ranging from one to five. In several instances cases of recognised diphtheria co-existed with sore throat in other members of the invaded households, and there was evidence pointing to a somewhat general distribution of sore throat in the locality. Fatality rate, 42·8 per cent.

At Bramshaw there were nine cases of diphtheria notified between January 22nd and February 14th, with a case fatality of 33·3 per cent. Outbreak preceded by cases of sore throat amongst pupils of Bramshaw Girls' School, which school appears to have acted as a focus of infection.

Considerable delay in notification, owing to arrangements for doing so being defective.
No hospital provision available.
No disinfecting apparatus.
Water supply chiefly from shallow wells, often liable to pollution.
Excrement disposal by pit privies, in many instances badly situated.
No byelaws :—Dairies, cowsheds, and milkshops not registered.

13. **Laxfield (Suffolk)** ; population (1891), 905; Dr. R. Bruce Low.

Sanitary Authority : Hoxne Rural.

Ground of Inquiry : Local report to the Board of an outbreak of anomalous illness.

Chief Facts reported by Inspector : Sudden outbreak of illness among young children early in April, the epidemic subsiding equally suddenly towards the end of that month. Symptoms comprised vomiting, drowsiness, fever, difficult breathing, cough, sore throat, and headache. Some patients had well-marked broncho-pneumonia. In particular cases diarrhœa, epistaxis, and profuse sweating were prominent symptoms. In a few there was a tendency to retraction of the head. Some had herpes of the lips, and most patients had enlargement of the cervical glands. The majority had discharge from eyes and nose; several had earache followed by ear discharge. Of 66 observed cases three had a mottled rash, but somewhat resembling scarlatina. Six cases proved fatal, all under three years of age. Disease infectious and spread by inter-relation of sick and healthy; resemblance of some cases to epidemic influenza, of others to rötheln, and of some to cerebro-spinal fever. The outbreak in many respects similar to that which occurred at Raunds in North Hants in 1891.

Laxfield not sewered. Water supply from a pond at end of village, where surface water is stored, and thence passed through a filter-bed of charcoal, sand, and gravel to a pump in the village street. Filter-bed had not been cleaned out for two years prior to the outbreak. Excrement disposal is by cesspit privies. Refuse disposal by uncovered ashpits. Some houses damp from absence of, or defects in, eaves-spouting. Illness not found to be related to local conditions; probably due to imported infection. (*See also* page 71 of present volume.)

14. **Linslade (Beds.)**; population (1891), 1,982; Dr. Bulstrode.

Sanitary Authority : Leighton Buzzard Rural.

Grounds of Inquiry : Insanitary condition of village, and outbreak of diphtheria.

Chief Facts reported by Inspector : Outbreak of diphtheria attended with low fatality rate; attacks not confined to any one part of village; majority had attended girls' school. Notification not in force, and much difficulty experienced by Medical Officer of Health in tracing cases.

Water supply from wells, three-fifths of which were reported to be polluted; many in positions liable to be specifically contaminated. Stream running through village converted into open sewer by discharge into it of drainage and of overflows from watercloset cesspools. . Condition of stream much complained of by inhabitants. Public water supply and proper sewerage urgently needed.

15. Long Benton Parish (Northumberland); population (1891), 10,821; Dr. R. Deane Sweeting.

Sanitary Authority: Tynemouth Rural.

Grounds of Inquiry: Diphtheria prevalence, and questions as to school-closure.

Chief Facts reported by Inspector: Ten localities of the parish affected between March and December 1894; unrecognised cases of sore throat, "mumps," and "swollen glands" preceded manifestation of true diphtheria. No common condition of insanitariness. Disease largely spread by school attendance; cases few during school-closure. Little fault to be found with the school itself. School closed by order of Rural Authority, and disease practically extinguished.

16. Mold (Flints); population (1891), 4,457; Dr. S. W. Wheaton.

Sanitary Authority: Mold Urban.

Ground of Inquiry: Prevalence of "fever"; Report of the Medical Officer of Health.

Chief Facts reported by Inspector: The occurrence of multiple attacks in households, and the association of the outbreak of fever with circumstances of privation among sufferers, had suggested the possibility of the disease in question being typhus fever. On inquiry it was found to be enteric fever. The fever had in all instances occurred in houses where unwholesome conditions existed, chief among which was the contamination of the soil around the dwelling by the soakage of filth from open midden steads, and from defective drains. The fever not spread by means of water or milk, but in some instances, probably, by emanations from defective sewers, in others by means of privies which had become infected by the excreta of sick persons; in others again by contagion within households.

Neither hospital nor disinfecting apparatus provided. Excrement disposal effected by midden privies of very defective construction, and badly scavenged. Sewerage and house drainage defective in the greater part of the district.

17. New Delaval Colliery Village (Northumberland); population (1891), 1,975; Dr. R. Deane Sweeting.

Sanitary Authority: Tynemouth Rural.

Ground of Inquiry: Outbreak of enteric fever.

Chief Facts reported by Inspector: During autumn of 1894, 129 fever cases with 10 deaths. Excessive incidence on two of the "rows" of the village, associated with inadequate drain-flushing. But earlier and practically simultaneous invasion of all of five groups of dwellings of the village due most probably to water supply; evidence of an open trough and a tank supplying the water having been exposed to organic contamination previous to the outbreak. Enteric fever also in two contiguous sanitary districts supplied with the same water. Chemical analysis of the particular water revealed turbidity and a large quantity of organic matter. Faulty conditions of excrement and refuse disposal throughout the village; practice of throwing "duff" on the ground around the "rows."

Spread of the fever favoured by almost total neglect of precautions. No hospital isolation or means of proper disinfection.

18. NEWPORT, BOROUGH OF; estimated population (1894), 10,512. Certain parts of the ISLE OF WIGHT RURAL DISTRICT adjacent to Newport; estimated population (1894), 1,190. PARKHURST PRISON; estimated population (1894), 1,131. PARKHURST BARRACKS; estimated population (1894), 700. Dr. Theodore Thomson.

Sanitary Authorities: Newport Town Council; Isle of Wight Rural.

Ground of Inquiry: Enteric fever. Memorial to the Board from ratepayers in Newport.

Chief Facts reported by Inspector: Simultaneous outbreaks of enteric fever and of "fever" of less definite sort in each of four separate places. These outbreaks referable, not to sewerage or drainage, nor to general sanitary circumstances, nor to milk supply, but to a public water supply common to all the invaded places. The public water supply in question derived from the Chalk at Carisbrooke, a village closely adjacent to Newport; and this supply found to be open to dangerous contamination. (*See also* page 45 of present volume.)

19. PENRITH (CUMBERLAND); population (1891), 8,981; Dr. Bruce Low.

Sanitary Authority: Penrith Urban.

Ground of Inquiry: Local complaint by a memorial to the Board as to condition of present water supply, and the need for a new one.

Chief Facts reported by Inspector: Supply taken from River Eamont, and pumped without filtration to town. Earthenware pipes from intake to pumping station laid through the main street of the village of Eamont Bridge; joints of these pipes open, and allowing inflow of soil water. Subsoil of Eamont Bridge gravelly, and polluted by soakage from privy middens, pigsties, dungheaps, &c. Above the water intake, and close to the river's banks, fields periodically manured. Some of these, within a mile of intake, for some time manured with sludge brought from the subsidence tanks of the Penrith Sewage Works. In addition, farmhouses and cottages near the river discharge slop water into the stream, and have privies and middens close to the running water. Five or six miles above the intake is the village of Pooley Bridge, the sewage of which in one way or another gains access to the Eamont. Other villages, lying back from the river a short distance, drain into tributaries of this stream. Thousands of tourists embark at Lake Ulleswater from the Pooley Bridge Pier. The steamer has two w.c.'s discharging into the lake. The Penrith Sanitary Authority engaged in discussing a new supply for over two years without practical progress. Advice given by their consulting engineers not adopted.

20. **Potterne, Parish of** (Wilts); population (1891), 1,185; Dr. Copeman.

Sanitary Authority: Devizes Rural.

Ground of Inquiry: Continued prevalence of diphtheria.

Chief Facts reported by Inspector: Anomalous throat illness attacked children attending National School in July 1893, followed later by outbreak of true diphtheria. Attacks numbered 143 in 65 houses. Schools repeatedly closed and re-opened, fresh cases not absent during periods of closure, but becoming especially abundant upon re-opening of schools. No attacks among children of wealthier residents not attending the school.

Water supply of bad quality, and drainage arrangements inefficient. Millpond choked with putrescent mud. No hospital accommodation provided for district, but temporary hospital provided and nurses engaged in village during outbreak. The Rural Authority do not possess any disinfecting apparatus.

21. **Rainham** (Essex); population (1891), 1,669; Mr. Evans.

Sanitary Authority: Romford Rural.

Ground of Inquiry: Diphtheria; Registrar-General's Returns.

Chief Facts reported by Inspector: Prevalence of "mumps" and sore throat among children attending the elementary school during February, March, and April 1893. Two cases of diphtheria notified in February and March; four cases, all proving fatal, in April; 71 additional cases, with 15 deaths, notified between April 1893 and February 1894. Infection spread, mainly by personal inter-communication in school, and thence conveyed to households in Rainham and to isolated dwellings in the surrounding country. Water supply from shallow wells, and from mains of South Essex Water Company. No sewers; houses drain into cesspools and ditches. No isolation hospital.

22. **Widnes, Borough of** (Lancashire); population (1891), 30,011; Dr. Bruce Low.

Sanitary Authority: Widnes Town Council.

Ground of Inquiry: Sustained mortality from enteric fever. Registrar-General's Quarterly Returns.

Chief Facts reported by Inspector: Continued presence of enteric fever in the borough for a series of years; increase of recognised cases during last three years. Evidence of importation at times from adjacent town of Runcorn, where fever has been prevalent. Spread of the disease in Widnes associated with fouling of air near dwellings by emanations from large midden privies, in which are stored collections of excrement and other filth under very unfavourable conditions. Surface of unmade roads, behind the houses, greatly fouled by human excrement every time the privy middens are emptied. No evidence of spread of disease in Widnes recently by contaminated milk, polluted water, or sewer air.

No. 6.

REPORT on an EPIDEMIC of ENTERIC FEVER in the BOROUGH of NEWPORT and in certain parts of the adjoining ISLE OF WIGHT RURAL DISTRICT; by DR. THEODORE THOMSON.

On October 25th, 1894, the Board received information that there was considerable prevalence of enteric fever in the Borough of Newport, in the Isle of Wight. In consequence of this information, as well as of a memorial to the Board, signed by a number of ratepayers in the Borough of Newport, requesting that an Inspector should be sent to conduct an inquiry in the district, I was on October 26th instructed by the Board to proceed to Newport, and to make inquiry into the circumstances under which enteric fever was prevalent there. I accordingly visited Newport on October 29th, and made investigation then and on many subsequent occasions into the conditions of prevalence of the fever in Newport and its vicinity.

At the outset I experienced considerable difficulty in ascertaining the amount and distribution of fever in the Borough of Newport. The information placed at my disposal on these points by the Sanitary Authority could not be regarded as of much value, owing to the absence of any system of notification of infectious disease in their district. Hence, with the view of arriving at a fuller knowledge of the amount of fever, I sought the assistance of the medical men practising in Newport, asking each of them to furnish me with a list of the cases of enteric fever that he was then attending, as well as of cases that he had previously attended there in 1894. From the information supplied to me in consequence of this request, I was enabled to ascertain the amount and distribution of the fever-prevalence in Newport. On November 3rd the Town Council passed a resolution asking the medical practitioners in Newport to voluntarily notify to them as Sanitary Authority all cases of enteric fever occurring in their practice, and offering to pay 2*s*. 6*d*. for every case so notified. Forms were supplied by the Town Council for this purpose; and on and after November 7th notification of enteric fever to the Sanitary Authority was in this way effected.

Meanwhile, I had learned that there was also prevalence of enteric fever in certain parts of the adjacent Isle of Wight Rural District, notably in the villages of Carisbrooke and Gunville; also that cases of fever had occurred in the Parkhurst Barracks and the Parkhurst Convict Prison, both of which are situated in the vicinity of Newport. No difficulty was experienced in obtaining information as to the fever in these places, inasmuch as there is compulsory notification of infectious disease in the Isle of Wight Rural District; while the authorities of both the Barracks and the Prison provided me with the necessary data as to cases of fever occurring in these institutions. From the facts which in these various ways came to my knowledge, it appeared that the number of persons attacked in 1894 by enteric fever in Newport and its vicinity was as follows:—

Borough of Newport - - - - - -	436
Adjacent portions of the Isle of Wight Rural District (not including the Prison and the Barracks) - - -	44
Barracks and Prison - - - - - -	36

Before dealing in detail with the behaviour of enteric fever in these places, I proceed to give a brief account of each, and of the relations of one to another.

The town of Newport is situated nearly in the centre of the Isle of Wight, at the junction of the Lukely Brook with the River Medina, and is about 4½ miles inland from the point where the Medina discharges into the sea. The central parts of the town range from 8 feet to 40 feet above Ordnance datum; while towards its northern, southern, and western boundaries the ground for the most part rises considerably above the level of the central portions, especially towards the north, where the surface attains a height of 112 feet. The geological character of the soil on which the town stands varies much at different points, owing to the almost vertical position of the strata in this neighbourhood, and the consequent narrowness of the strips representing the various beds that cross Newport from east to west. Thus, the extreme southern part of the town is at the junction of the Chalk with the Reading beds; and in proceeding in a northerly direction, the London Clay, the Bagshot beds, the Osborne beds, the Bembridge beds, and the Hempstead beds are in turn encountered. Over a considerable part of the area occupied by Newport, brick-earth is found; and this, with the clay so largely represented in the beds above enumerated, mainly forms the soil on which the Borough stands. The area of the Borough of Newport is 511 acres; and its greatest length (from north to south) is somewhat over a mile, while its greatest breadth (from east to west) is rather less than a mile. At the census of 1891 it contained 2,197 inhabited houses, and had a population of 10,216. The central parts of the Borough are the most thickly built upon; but a considerable number of houses lie on and near the main roads that radiate to surrounding districts, and this is especially the case in the northern and in the south-western parts of the Borough. Newport is a market town, and has also some shipping trade; while other industries that afford occupation to its inhabitants are brewing, brick-making, and fellmongering. With very few exceptions, houses are drained to public sewers, which discharge their contents in a crude state into the Medina near the point in that river where the Lukely joins it. The water supply of the town is almost entirely derived from wells in the Chalk, situated at Carisbrooke, and is in the hands of the Corporation.

Those parts of the Isle of Wight Rural District in which I found prevalence of enteric fever were principally the villages of Carisbrooke and Gunville, and the Barracks and the Convict Prison at Parkhurst. There were also a few scattered cases in houses beyond the Borough of Newport, near Shide, Barton Village, and Cross Lane; but the aggregation of population beyond the Borough limits at these points is, in each instance, very small, and detailed description of these places therefore is not requisite.

The village of Carisbrooke lies south-west from Newport, to which it is contiguous. The larger part of the village lies on the Chalk; but a good many houses are on the Reading and London Clays. In the autumn of 1894 the population was 640, and the number of inhabited houses was 159.

The water supply is partly from the Newport public service, partly from local wells or from rain-water tanks. Only a small part of the eastern end of the village is sewered; and these sewers discharge their contents in a crude state into a neighbouring stream. The rest of the village is unsewered, and drains either into cesspools or into open gutters and ditches.

The village of Gunville lies to the west of Newport, from which it is about three-quarters of a mile distant. It is situated on the Osborne, Bembridge, and Hempstead beds. The population in the autumn of 1894 was 423, and the number of inhabited houses 96. The water supply is from the Newport public service, or from local wells, or rain-water tanks. There is no system of sewerage in the village; houses

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either drain into ditches or are entirely unprovided with means of drainage.

Parkhurst Barracks and *Parkhurst Convict Prison* both lie to the northward of Newport, from the nearest point of which they are about half a mile distant. Both are situated on the Hempstead beds. In November 1894 the population of the Prison was 1,131; that of the Barracks was about 700. These two institutions have a common system of sewerage. Both Barracks and Prison derive their supply of water for drinking and cooking purposes from the Newport public service.

HISTORY OF ENTERIC FEVER IN THE INVADED PLACES.

The number of deaths attributed to enteric fever during the 11 years 1884–94, in each of the above described places, is shown in the following table (Table I.).

TABLE I.—Showing, Year by Year, for the 11 Years 1884–94, the DEATHS from ENTERIC FEVER in the BOROUGH of NEWPORT, and in certain adjacent parts of the ISLE OF WIGHT RURAL DISTRICT, PARKHURST CONVICT PRISON, and PARKHURST BARRACKS; and affording comparison of DEATH RATES from this cause in the BOROUGH, and in ENGLAND and WALES.

Year.	Borough of Newport.			Number of Deaths from Enteric Fever in the			England and Wales.
	Estimated Population.	Number of Deaths from Enteric Fever.	Enteric Fever Death Rate per 1,000 living.	Adjacent Isle of Wight Rural District.	Parkhurst Prison.	Parkhurst Barracks.	Enteric Fever Death Rate per 1,000 living.
1884 - -	9,628	3	0·31	—	1	—	0·24
1885 - -	9,713	2	0·21	—	—	—	0·17
1886 - -	9,799	1	0·10	2	—	—	0·18
1887 - -	9,885	1	0·10	—	—	2	0·18
1888 - -	9,972	1	0·10	—	—	—	0·17
1889 - -	10,060	2	0·20	—	—	—	0·18
1890 - -	10,149	2	0·20	—	—	—	0·18
1891 - -	10,238	1	0·10	—	—	—	0·17
1892 - -	10,329	0	—	2	—	—	0·14
1893 - -	10 420	1	0·10	—	—	—	0·23
1894 - -	10,512	42	3·99	7	2	—	0·16*

From the figures in the foregoing table it will be seen that in the 10 years 1884–93, the history of the invaded places was not unfavourable as regards enteric fever. In Newport the annual death rate from this cause was usually less than that for England and Wales; and if the mean rate for these 10 years be taken it will be found that it was 0·14 in Newport as compared with 0·18 per thousand persons living in England and Wales. During the same 10 years it will be noted that four deaths were attributed to enteric fever in those parts of the Rural District adjacent to Newport; and that but one death in the prison and two in the barracks were referred to this cause.

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* Taken from the Registrar-General's quarterly returns; and includes, therefore, deaths from typhus fever, and simple or ill-defined forms of continued fever, as well as from enteric or typhoid fever.

The Enteric Fever Outbreak of 1894.

In the following table (Table II.) is shown the number of cases designated enteric fever that are known to have occurred in 1894 in the several places that I have described. The table also affords information as to the estimated population of each place and indicates the proportion of the inhabitants attacked by enteric fever in each instance.

TABLE II.—Showing severally for the BOROUGH of NEWPORT, for certain adjacent parts of the ISLE OF WIGHT RURAL DISTRICT, and for PARKHURST CONVICT PRISON and PARKHURST BARRACKS, the NUMBER of CASES designated ENTERIC FEVER ascertained to have occurred in 1894, along with the RATE of ATTACK per 1,000 of POPULATION in each instance.

Place invaded by Enteric Fever.	Estimated Population in 1894.	Number of Cases of designated Enteric Fever.	Attack Rate per 1,000 Population.
Borough of Newport - - - -	10,512	436	41·5
Adjacent Isle of Wight R.D. - -	1,190	44	36·9
Parkhurst Prison - - -	1,131	27	23·9
Parkhurst Barracks - - -	700	9	12·9
Total - - -	13,533	516	38·1

From this table it appears that, while the Borough of Newport suffered most, relatively as well as actually, certain parts of the Isle of Wight Rural District adjacent to Newport were also markedly affected by the fever, and that a not inconsiderable proportion of the occupants of the Barracks and of the Convict Prison were attacked by the disease.

The incidence of *fatal* enteric fever in these places in 1894 is shown in the following table (Table III.).

TABLE III.—Showing severally for the BOROUGH of NEWPORT, for certain adjacent parts of the ISLE OF WIGHT RURAL DISTRICT, and for PARKHURST CONVICT PRISON and PARKHURST BARRACKS, the NUMBER of DEATHS referred to ENTERIC FEVER in 1894, and the resulting DEATH RATES per 1,000 INHABITANTS.

Place invaded by Enteric Fever.	Estimated Population in 1894.	Number of Deaths from Enteric Fever.	Enteric Fever Death Rate per 1,000 Inhabitants.
Borough of Newport - - - -	10,512	42	3·99
Adjacent Isle of Wight R.D. - -	1,190	7	5·88
Parkhurst Prison - - - -	1,131	2	1·77
Parkhurst Barracks - - - -	700	—	—
Total - - - -	13,533	51	3·77

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Incidence of the Fever on Age.

In the following table (Table IV.) is shown the age incidence of enteric fever attacks and deaths on the population of Newport, as regards which place alone complete data were available concerning incidence of the disease in reference to age and sex.

TABLE IV.—Showing for the BOROUGH of NEWPORT the incidence of ENTERIC FEVER ATTACKS and of ENTERIC FEVER MORTALITY on various AGE GROUPS.

Age Group.	Estimated Population in 1894.	Number of Cases of Enteric Fever.	Enteric Fever Attack Rate per 1,000 Population.	Number of Deaths from Enteric Fever.	Enteric Fever Death Rate per 1,000 Population.
Under 5 -	1,320	37	28	1	0·8
5–10 - -	1,229	101	82	1	0·8
10–15 - -	1,164	128	110	10	8·6
15–25 - -	1,848	98	53	13	7·0
25–35 - -	1,432	36	25	11	7·7
35 + - -	3,519	36	10	6	1·7
Total -	10,512	436	41·5	42	3·99

It appears from this table that the incidence of *attack*, both actual and relative, was heaviest at ages 5–15 years; but that up to the age of 10 years the *mortality* (whether actual or relative) was altogether insignificant. And not the least striking feature exhibited by the table is the sudden increase of mortality at 10–15 years to nearly eleven times the mortality at 5–10 years. Taken in connexion with the fact that the incidence of attack at ages 10–15 years is not greatly in excess of the incidence of attack at ages 5–10 years, this of course indicates that children aged 5–10 years, although very liable to attack by enteric fever, are in no great danger of dying of this disease; and this fact is further illustrated by the following table (Table V.) in which, along with the number of attacks and of deaths due to enteric fever, is shown the fatality from this cause at various age periods.

TABLE V.—Showing for the BOROUGH of NEWPORT the NUMBER of PERSONS ATTACKED by ENTERIC FEVER, and the NUMBER of DEATHS attributed to this CAUSE, at each of certain AGE-PERIODS; together with the PROPORTION of DEATHS to ATTACKS in each instance.

Age Group.	Number of Persons attacked by Enteric Fever.	Number of Enteric Fever Deaths.	Number of Deaths per cent. of Attacks of Enteric Fever.
Under 5 - - - - -	37	1	2·7
5–10 - - - - -	101	1	1·0
10–15 - - - - - -	128	10	7·8
15–25 - - - - -	98	13	13·3
25–35 - - - - - -	36	11	30·6
35 + - - - - -	36	6	16·6
At all ages - - - - -	436	42	9·6

These figures show that fatality of enteric fever is low in persons under 10 years of age, while it is considerable among older persons.

Incidence as regards Sex.

Of the 436 persons attacked by enteric fever in the Borough of Newport in 1894, 219 were males and 217 were females. Inasmuch as, in the middle of 1894, the male population was estimated at 4,930, and the female population at 5,582, the male attack rate was 44 per thousand, and the female attack rate 39 per thousand.

Of the deaths attributed to enteric fever, 22 occurred among males and 18 among females, corresponding to a male death rate of 4·5 per thousand living, and a female death-rate of 3·2 per thousand living.

Doubtful Cases of Fever.

In addition to the cases of enteric fever known to have occurred in the various places invaded, there came to be heard of also a number of attacks of illness of less definite nature, of which some were notified by the medical attendant as "doubtful" enteric fever, while others were not notified at all. The number of these was as follows:—

Borough of Newport - - - - - -	32
Certain adjacent parts of the Isle of Wight Rural District - - - - - - - -	6
Parkhurst Prison - - - - -	2
„ Barracks - - - - -	3
Total - - -	43

Four cases of illness of a suspicious sort also occurred among inmates of the Workhouse, which lies some 300 yards beyond the northern boundary of the Borough of Newport. To these cases I shall again refer at a later stage of this Report.

Incidence of the Fever in Time.

In the following table (Table VI.) the number of cases of enteric fever as well as of doubtful cases during 1894 in the invaded places, are set forth month by month to the end of April, and in fortnightly periods during the remainder of the year.

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TABLE VI.—Showing the NUMBER of ENTERIC FEVER ATTACKS, and also of ATTACKS of ILLNESS resembling ENTERIC FEVER, ascertained to have commenced in each of the Months of January, February, March, and April 1894, and in each Fortnight from May to December 1894, in the BOROUGH of NEWPORT, in certain adjacent parts of the ISLE OF WIGHT RURAL DISTRICT, and in PARKHURST CONVICT PRISON and PARKHURST BARRACKS.

Period.	Borough of Newport.		Certain Adjacent parts of Rural District.		Parkhurst Barracks.		Parkhurst Prison.	
	Enteric Fever Cases.	Doubtful Cases.	Enteric Fever Cases.	Doubtful Cases.	Enteric Fever Cases.	Doubtful Cases.	Enteric Fever Cases.	Doubtful Cases.
January - -	—	—	—	—	—	—	—	—
February - -	3	—	—	—	—	—	—	—
March - -	—	—	—	—	—	—	—	—
April - - -	—	—	—	—	—	—	—	—
May 1-14 - -	2	—	—	—	—	—	—	—
„ 15-28 - -	4	*1*	—	—	—	—	—	—
„ 29-June 11 -	5	—	1	—	—	—	—	—
June 12-25 - -	4	*1*	1	—	—	—	—	—
„ 26-July 9 -	4	—	—	—	—	—	—	—
July 10-23 -	6	*2*	—	—	—	—	—	—
„ 24-Aug. 6 -	8	*1*	—	*1*	—	—	—	—
Aug. 7-20 - -	4	—	2	—	—	—	—	—
„ 21-Sept. 4 -	13	*2*	—	—	—	—	—	—
Sept. 5-18 - -	10	*1*	1	—	—	—	1	—
„ 19-Oct. 2 -	18	*4*	—	—	—	—	—	—
Oct. 3-16 - -	100	*8*	9	—	2	*1*	1	—
„ 17-30 - -	109	*6*	12	*5*	4	*2*	9	*1*
„ 31-Nov. 13 -	79	*3*	11	—	2	—	4	—
Nov. 14-27 - -	45	*3*	6	—	—	—	9	—
„ 28-Dec. 11 -	15	—	—	—	1	—	2	—
Dec. 12-25 - -	4	—	1	—	—	—	1	—
„ 26-31 - -	3	—	—	—	—	—	—	*1*
1894 -	436	*32*	44	*6*	9	*3*	27	*2*

On the accompanying chart the incidence of the disease as regards time is shown for the several invaded places day by day, during the latter half of the year. Both table and chart are based upon dates of attack; careful investigation having been made in each instance as to the day on which the first symptoms of illness occurred. Examination of the data thus afforded shows that, both in Newport and in certain adjacent parts of the Isle of Wight Rural District, there was unusual amount of enteric fever during the period May–September; and that with the commencement of October, there was a sudden and very large increase of the fever, both in Newport and in the adjacent Rural District. Also that, from the beginning of October both in Newport and in the adjacent Rural District, the fever continued very prevalent for some eight weeks; after which, towards the end of November, there was a marked decrease in its amount, so that by the end of December, the fever prevalence had practically ceased. During the period, May–September, no case of enteric fever, it will be observed, is known to have occurred in the Barracks, and but one in the Prison. But from the beginning of October the behaviour of the disease, which then markedly manifested itself in both Barracks and Prison, was as regards time-incidence, very similar to that of the fever in the borough of Newport and the adjacent parts of the Isle of Wight Rural District.

Incidence of the Fever as regards Locality.

The incidence of the fever as regards locality is illustrated by a series of maps appended to this Report.* These maps depict the distribution of the disease from May 1st to December 23rd. From the beginning of May to the end of September, during which time the amount of the fever was relatively small, each map represents the facts for one month; from the beginning of October, when there was great increase of fever, the maps represent fortnightly periods. On all these maps each case designated enteric fever is indicated by a red dot; each doubtful case by a blue dot.

Examination of the manner of distribution of the disease, as illustrated by these maps, shows that the main incidence of the fever was in the Borough of Newport, the villages of Carisbrooke and Gunville, the Prison, and the Barracks. Also it appears that there were some scattered cases among the inhabitants of the few houses that lie outside the Borough of Newport at Shide, Barton Village, and Cross Lane. The arrangements of the spots on the maps suffices to indicate that distribution of the fever was fairly uniform throughout the several invaded areas. Thicker clustering of spots here and there, as in the central parts of Newport and in the Hunny Hill neighbourhood, is referable to the larger aggregation of population in these quarters. The spots representing cases in the Prison and in the Barracks are not placed over the particular parts of the buildings in which these persons resided, but are, for convenience, grouped together within the grounds of these institutions. As matter of fact, there was no localisation of the disease to any one part of either Prison or Barracks.

CAUSATION OF THE OUTBREAK.

In searching for the cause of the outbreak of enteric fever in Newport and its vicinity in 1894, it had to be borne in mind that no reputed fever-distributing agency could be regarded as affording a sufficient explanation of the dissemination of the disease unless it had an area at least as wide as the prevalence of the fever and possessed also, within these limits, a range of operation parallel to the observed uniform distribution of the disease. Nor could a possible fever agency fulfilling the above conditions be accepted as entirely satisfactory, unless it also sufficed to account for the coincidence in time of the outbreak in the several areas. The investigation that was undertaken accordingly took account of these several conditions, and, as result of this investigation, I now proceed to set forth, in reference to the invaded areas, facts

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ascertained by me regarding a number of agencies which have, elsewhere, been regarded as having been concerned in enteric fever prevalence. In this way I shall in turn treat of the sewerage and drainage arrangements, the general sanitary circumstances, the milk supplies, and the water supplies of each of the invaded places.

Sewerage and Drainage.

Borough of Newport.—The Newport sewers, which have for the most part sufficient fall, discharge their contents in a crude state by six separate outlets into the Medina River. They are tide-locked usually for some three hours about high water. In the central portions of the Borough the majority of the sewers are old, and are brick-barrel sewers. These old sewers are entirely devoid of proper means of ventilation. But in great part of the outlying portions of the Borough, as well as in some streets in the centre of Newport, the sewers are of glazed stoneware pipes provided with a sufficiency of suitable ventilating shafts and openings. At points where new sewers communicate with old sewers "leads" or "flap-valves" are fixed with the view of preventing aërial communication between the two sets of sewers. The new sewers are fitted with automatic flushing tanks; the old sewers cannot be systematically flushed except by pouring water down the road gullies.

House drainage in many instances, more especially in the central parts of Newport, is effected by old brick-barrel drains or by imperfectly glazed stoneware pipes; and in these cases there is usually no disconnecting trap between house drain and sewer. The more modern dwellings, however, and also those of the older houses in regard of which drainage has recently been re-laid, are provided with properly glazed and trapped earthenware pipe drains. Many drains pass under houses, and even in the more recently constructed dwellings such drains are not embedded in concrete if they are more than 2 feet beneath the ground surface. Drains passing under old houses are rarely embedded in concrete even when within less than 2 feet of the ground surface. Yard drains are in very many instances provided with bell traps, not infrequently in a damaged condition. Disconnection of interiors of houses from drains is not infrequently imperfect or wanting; not a few sink pipes and other waste water pipes are in direct communication with drains, and soil pipes are usually imperfectly ventilated, or entirely devoid of means of ventilation.

Carisbrooke Village.—A very large part of the village of Carisbrooke is unsewered; a few houses, however, in the eastern end of the village, drain to sewers situated in the High Street, which discharge their contents in a crude state into a neighbouring stream. Watercloset sewage is not allowed to pass directly into these sewers; but they receive the overflow of cesspools into which waterclosets discharge. In the unsewered portion of Carisbrooke, slop drains discharge into cesspools, or to open street gutters; or, in the absence of drainage arrangements, slops are thrown upon adjacent gardens. House drains are for the most part formed of glazed earthenware pipes, but not a few are square brick structures. Cesspools, which are numerous in the village, are constructed of brick, and usually permit soakage of their contents into the surrounding soil. Sink pipes and waste pipes are properly disconnected from the drains to which they discharge; and soil pipes are for the most part provided with sufficient means of ventilation.

Gunville Village.—There are no sewers in the village of Gunville; the few house drains that exist there discharge into a neighbouring watercourse or to open gutters in the public road. For the most part drainage arrangements are wanting, and slops are thrown upon garden ground. Sink pipes are disconnected from drains to which they discharge.

The Barracks and the Prison have a common system of sewerage. The sewers consist of glazed stoneware pipes, which converge to an outfall some few hundred yards from these institutions. At this outfall the sewage, after treatment by the ferrozone process and subsequent settlement and precipitation with lime, is filtered through sand. The resulting effluent discharges into a neighbouring stream which flows into the Medina. All sink pipes and waste-water pipes are properly disconnected from the drains to which they discharge.

It thus appears: (1) That Newport has its own system of sewers which at no point extend beyond the Borough boundary; (2) that Carisbrooke is sewered only in small part, and that what sewerage system it has is entirely unconnected with that of any other of the invaded places; (3) that Gunville has no sewers; and (4) that the Barracks and Prison sewerage system, while common to these two institutions, is in no way connected with that of any of the other invaded places. These five places then, have, with the exception of the Barracks and the Prison, no community of condition in the matter of sewerage arrangements, and accordingly sewers cannot be thought of as the medium by which one and the same stock, so to speak, of enteric fever was at one and the same time disseminated throughout the invaded areas. Nor are the facts requiring explanation better fitted by assumption of an alternative and altogether remotely possible contingency, namely, coincident spreading abroad in the five places, by means in each instance of their local drainage arrangements, of enteric fever infection that had been antecedently and independently introduced into the sewers or drains. In Newport there was no notable incidence of the fever on any particular line of sewer; and houses draining to the new sewers suffered quite as much as houses draining to the old sewers, notwithstanding the advantage possessed by the new over the old sewers in the matter of construction and of ventilation. Similarly at Carisbrooke and at Gunville, dwellings having in some sort community of drainage did not suffer fever in excess of dwellings separately drained or of dwellings without drainage; moreover in both places, and in Newport also, many of the invaded dwellings were provided with a better class of drainage than were other and more numerous houses which escaped fever. So too as regards the Prison and the Barracks, their drainage arrangements were not of a character to afford any ground for suspecting them as constituting the agency whereby enteric fever was spread in these institutions.

General Sanitary Circumstances.

Borough of Newport.—For the most part the houses in the Borough of Newport stand on clay or brick earth, but in some parts of the town this is replaced by soil of a sandy or gravelly character. Many of the houses are old and not a few are damp. There is a fair amount of open space around most houses, save in the older parts of the town where dwellings are sometimes so huddled together as to preclude sufficiently free circulation of air round them. Interiors of houses are generally clean. Excreta are removed by water carriage. In-door waterclosets are often of antiquated pattern and are not always placed on external walls; out-door waterclosets are usually of the long hopper type and devoid of flushing apparatus. House refuse is stored in movable receptacles, the contents of which are removed by the Authority daily in some parts of the district, and not less frequently than twice a week in any neighbourhood. Yards are usually kept clean and are provided with a strip of paving in the vicinity of the dwelling. Streets for the most part have macadam roadways and cement footpaths; they are kept clean. Nuisance is in some instances caused by offensive smells resulting from the keeping of pigs. Nuisance is also liable to arise from the state of the Medina immediately below the Town Quay, where at low tide banks of black and foul-smelling mud are exposed by the retreating water.

Carisbrooke Village.—The houses of Carisbrooke Village stand mostly on a few feet of light mould over-lying the Chalk; some of the houses, however, are on the stiff clay of the Reading and London beds. Dwellings are provided with sufficiency of open space around them, and their condition is in general good. Yard paving in some instances leaves a good deal to be desired. Interiors of houses are clean. Excreta are mostly disposed of in cess-pit privies, but there are not a few houses provided with waterclosets or with pails. Waterclosets drain into cesspools, which for the most part leak into and pollute the neighbouring soil. Scavenging of privies and pails is undertaken by a parochial committee of the Rural District Council, which sees to removal of the contents on receiving notice to do so from the householder. Ashes are stored in movable receptacles or in heaps in gardens, to be removed by the committee before mentioned or to be utilised for garden purposes. Roads are fairly well constructed and are kept clean.

Gunville Village.—The houses at Gunville are situated on the clay of the Osborne, Bembridge, and Hempstead beds. They are good dwellings, with ample open space about them, and are kept clean. Excreta are disposed of in cess-pit privies or in pails; and the contents of these, as well as house refuse, are used for garden purposes. Roads are fairly well constructed and are kept clean.

The Barracks and the Prison.—The prison buildings are well constructed, those at the barracks are old and in indifferent condition. Both stand upon clayey soil. Excreta are disposed of by waterclosets and "latrines."

The account just given of the general sanitary circumstances of the several places invaded by enteric fever fails in affording any reasonable explanation of the simultaneous prevalence of the fever in all. In some of the places conditions exist that are in themselves undesirable. Thus, in Newport, some dwellings are damp and dilapidated; waterclosets are often unsatisfactory; and nuisance arises from pig keeping and from the foul condition of the Medina. It was not, however, found that persons residing in houses or neighbourhoods thus circumstanced suffered more from the fever than did their more fortunate neighbours. The village of Carisbrooke, again, is honeycombed with cesspools, mostly in the Chalk, the contents of which soak into and pollute the surrounding soil. Houses, nevertheless, standing on the impervious clay were invaded by the fever to much the same extent as those standing on the pervious and polluted Chalk. Gunville and the Prison, which compare favourably with other invaded places as regards general sanitary circumstances, nevertheless suffered considerably from fever. The explanation, therefore, of simultaneous fever prevalence in Newport, Carisbrooke, Gunville, the Prison, and the Barracks, is not to be

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found in defects, common or particular, of general sanitary circumstances.

Milk Supply.

Careful inquiry was made as to the source of milk supply of every household in which a case of enteric fever had occurred. Special attention was paid to milk as a possible cause of fever prevalence, because of the large incidence of the disease upon children as shown in Table IV. It will be remembered that from the data given in that table it appeared that in the Borough of Newport persons between the ages of 5 and 15 had suffered most heavily in proportion to their numbers; and, as is well known, exceptional incidence of enteric fever on children is a characteristic of the disease when it has been disseminated through the agency of either milk or water. On investigation, however, it appeared that in the Borough of Newport the fever had not especially prevailed among consumers of any particular milk supply; indeed, it was found that customers of no fewer than 42 different milk vendors had contracted the disease. In like manner it was found that persons attacked by the fever in the adjacent Rural District had derived their milk supply from one or another of 14 different sources. Further, in Parkhurst Prison those convicts of whose diet milk formed part were supplied from the Prison farm; and the soldiers in Parkhurst Barracks likewise had a separate milk supply. Under these circumstances it is clear that milk is not to be regarded as the agent whereby enteric fever had been simultaneously disseminated throughout the several invaded places.

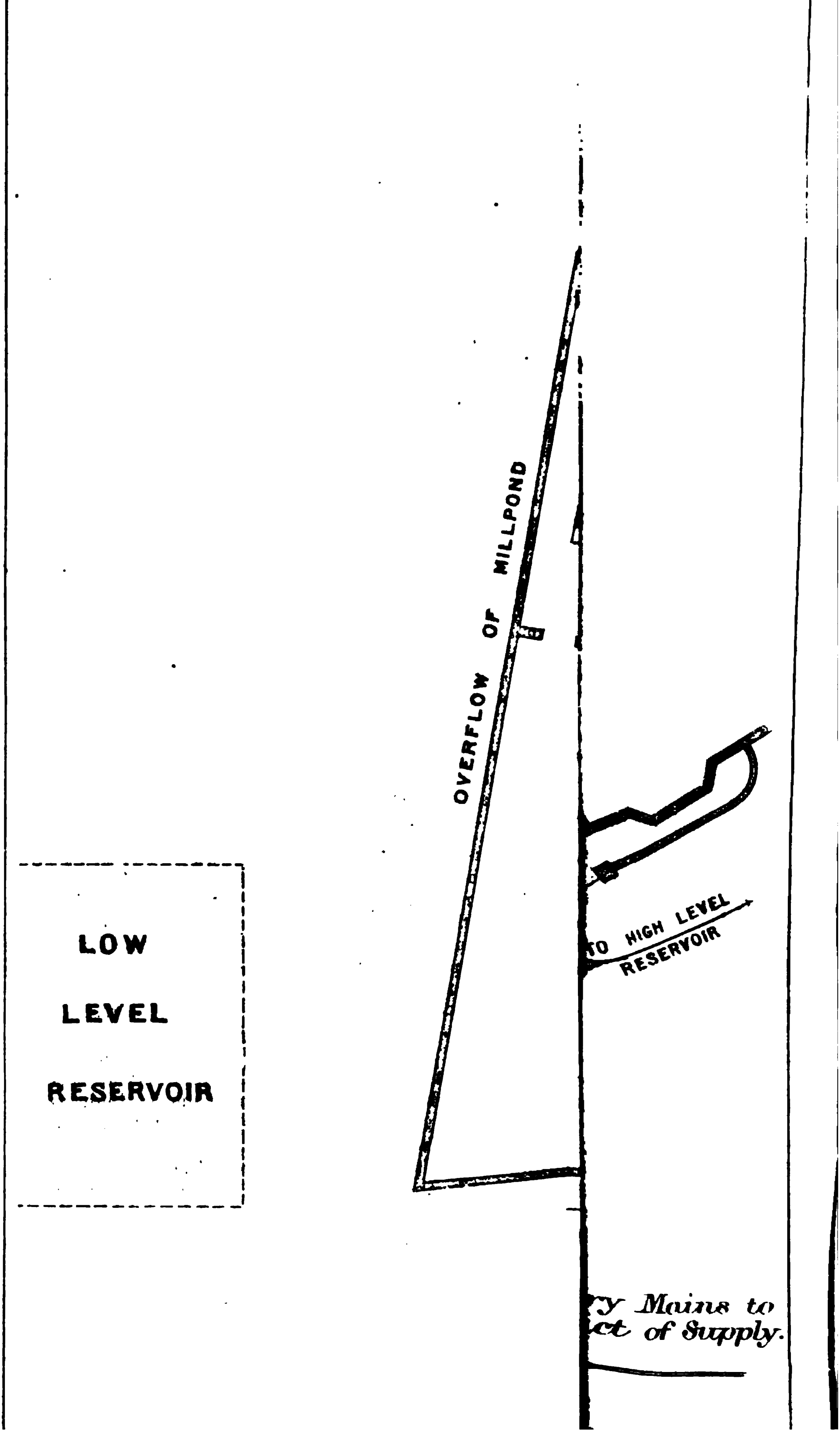
Water Supply.

In the absence of such community of conditions in the matters of sewerage, drainage, general sanitary circumstances, or milk supply as would point to one or other of these as agency whereby fever had been spread in the invaded places, attention was directed to water supply; and inquiry was made as to the sources and the distribution of water employed for domestic purposes in these places. The facts ascertained in this regard I now proceed to set forth.

Borough of Newport.—There are in the Borough of Newport some 2,260 inhabited houses, of which, according to the Inspector of Nuisances, about 50 only derive their water supply from local wells. The remainder are provided with water from the Newport public supply, which is in the hands of the Corporation of Newport. This supply is obtained from springs and from wells in the Chalk, situated at the eastern extremity of Carisbrooke Village, and near the south-western corner of the Borough of Newport. The wells are two in number, and the springs are situated in the immediate neighbourhood of the wells. The supply obtained from the wells is known as the high-level service; that obtained from the springs is termed the low-level service. The spot where the wells are sunk and where the springs come to the surface is on the Upper Chalk, which is at this point covered only by a very thin layer of light soil.

The springs that form the low-level service rise through this thin layer of soil to the ground surface and are with one exception impounded at the points where they rise in a reservoir which is 65 feet in length and 45 feet in breadth. The depth of water in this reservoir is usually about 4 feet. The one exception referred to consists of a spring which rises to the surface in an adjacent field at a point some 60 feet to the east of the reservoir, to which its waters are conducted by 6-inch iron pipes.

CHART


OVERFLOW OF MILLPOND
LOW LEVEL RESERVOIR
TO HIGH LEVEL RESERVOIR
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The reservoir is formed by 9-inch brick walls set in cement and cemented on their inner surface, and is roofed over by brick arches. The bottom of the reservoir, through which springs bubble up, is unlined, and there is no protective wall of puddled clay or other material surrounding the reservoir. There is an overflow from the reservoir into an adjacent stream.

The wells which furnish the high level service are two in number, and are known as the "old well" and the "new well" respectively. Both old and new wells are sunk in the Chalk. The "old well" was sunk in 1876, and has a depth of 23 feet. From its bottom a bore hole passes down a further depth of 20 feet. The total depth, therefore, of well and bore hole from the ground surface is 43 feet. The diameter of the well is 6 feet; that of the bore hole is 18 inches. The sides of the well are lined with 9-inch brickwork, set in cement; the bottom of the well is unlined, and is formed by the Chalk. There is no wall of puddled clay or other protective material round the well. The bore pipe is of perforated iron tubing. The "new well" was sunk in 1891, and has a depth of 27 feet. From its bottom a bore hole proceeds downwards for a further depth of 80 feet. The total depth of well and bore hole is therefore 107 feet. For a distance of 4 feet from the surface of the ground, the well is lined by 18-inch brickwork set in cement and surrounded by an 18-inch concrete wall. The remaining portion of the well is lined with iron cylinders. The concrete lining referred to as surrounding the brickwork is continued downwards for a depth of 18 inches around the topmost iron cylinder. The bottom of the well is lined with iron. At its mouth this well has a diameter of 8 feet 6 inches, diminishing to a diameter of 6 feet 6 inches at the bottom. The bore pipe is of iron tubing, which for a depth of 30 feet has a diameter of 18 inches, while the diameter of the remaining 50 feet is 15 inches. The bore pipe is perforated from a point 9 feet below its junction with the well to its termination.

The amount of water obtained from the springs constituting the low-level supply is unknown; that supplied from the wells constituting the high-level service averaged about 339,000 gallons per day during the week ending November 4th, 1894.

The low level supply is distributed by gravitation to the lowest lying portions of Newport. The area thus furnished with water is in the central part of the town, and is comparatively small. The supply is a constant one. All the outlying parts of the Borough and a large amount of the central portion are supplied from the high-level service. The water of this service is obtained by pumping from the two wells, which are united by a siphon. Part of the water thus procured is delivered directly to the area of supply for consumption, while other part is pumped into a reservoir, known as the high-level reservoir, from which, when direct supply from the wells is shut off, it is distributed by gravitation throughout the district. The main from the wells to the high-level reservoir serves also as the return main by which water is delivered from the high-level reservoir to the area of supply. The high-level supply is not a constant one, water being furnished from it usually from 7 a.m. to 7 p.m. only. The high-level reservoir is situated on rising ground near the western end of Carisbrooke, and is about a quarter of a mile distant from the waterworks. It is 70 feet in length by 50 feet in breadth, and is 10 feet in depth. Its walls are constructed of 14-inch brickwork, cemented in the interior, its bottom is lined with concrete, and it is roofed in by brick arches. The low level and the high-level supplies are conveyed to Newport by separate mains; but within the Borough, communications exist between the two supplies in such fashion that, when desired, the high-level water can be admitted to the low-level mains. The high-level water is stated to be frequently furnished in this way to the low-level area, since the pressure at which the low-level water is distributed is often insufficient to afford a satisfactory supply.

In the village of Carisbrooke there are 159 inhabited houses, and of these 121 derive their water supply from the high-level branch of the Newport public water service. Of the remaining 38 houses 32 have local wells, mostly shallow and dry steined, while 6 obtain their water from rain-water tanks.

The village of Gunville consists of 96 houses, of which 67 are supplied with water from the Newport high-level public service; while of the remaining 29, 16 have local wells, and 13 derive their supply from rain-water tanks.

The Parkhurst Convict Prison and the Parkhurst Barracks are, as has been said, entirely furnished with water for drinking and cooking purposes from the high-level service of the Newport public water supply.

It will be seen, therefore, that in the Newport public water service there existed a condition which was common to all the places known to have shared in the enteric fever outbreak which is the subject of this Report. But if this particular water supply was the agency by which the fever was disseminated, it was to be expected that incidence of the disease would have been much heavier on persons known to have consumed this water than on persons who made use of water derived from other sources. It is desirable, therefore, to consider in regard of each of the invaded places what proportion of consumers of the Newport public water supply was attacked by fever as compared with the proportion of consumers of other water supplies that suffered fever.

It will be remembered that the number of houses in the borough of Newport that derive their water supply from local wells is estimated at 50; and thus, taking the ordinary ratio of inhabitants to houses in Newport, the number of consumers of water other than that furnished by the public service may be estimated at about 240. The number of persons residing in houses that receive the public water supply is estimated at 10,272. Of these latter, 417 were attacked by the fever; of the former, 19 suffered in this way. But, as result of inquiry, it appeared that of these 19 persons, no less than 15 had been drinking (unboiled) water from the public supply. As regards the remaining four, information as to their having consumed this water was not forthcoming. Thus, of the 436 cases of fever in Newport, 432 had been consumers of the public supply; while four are not known to have drunk of this water. As result of these investigations, it appears that the attack rate in the borough among consumers of Newport water was 4·2 per cent. as compared with 1·7 per cent. among non-consumers of this water.

In the village of Carisbrooke, 121 houses are on the Newport public service; while 38 houses derive their water supply from other sources. The inhabitants of the former may be estimated as 486, and the inhabitants of the latter as 154. Among consumers of Newport water, 21 cases of enteric fever are known to have occurred; of persons resident in houses supplied with other water, 7 were attacked by the fever. These figures show but little difference in the proportions of persons attacked in the two groups. But, on inquiry, it was found that of the seven cases among occupants of houses not supplied with Newport water, four had prior to their illness been drinking (unboiled) Newport water, while one had, in the earlier stages of the disease, been removed from Newport to her home at Carisbrooke. No evidence was forthcoming as to the remaining two persons having drunk Newport water. As result, then, of these inquiries it appeared that of the 28 persons attacked in Carisbrooke, 25 had drunk (unboiled) Newport water; one had removed from Newport to Carisbrooke while actually suffering from the disease; while two are not known to have drunk of Newport water. The incidence at Carisbrooke on consumers of the Newport water supply, therefore, was very much heavier than on consumers of other supplies.

In Gunville, Newport water is furnished to 67 houses, representing a population of 295 persons; while 29 houses, with an estimated population of 128, are supplied with other water. Of the former group, seven were attacked by the fever; of the latter, one person only suffered. Further, this single person was found to have drunk (unboiled) Newport water antecedent to attack. In Gunville, accordingly, no person is known to have suffered fever who had not drunk (unboiled) Newport water.

In other parts of the Isle of Wight Rural District adjacent to Newport, eight cases of enteric fever are known to have occurred. These cases occurred in houses dotted around the Borough margin near Shide, Barton Village, Cross Lane, and Hunny Hill. I do not possess complete statistics of the proportion of houses in these neighbourhoods furnished with Newport water and water from local supplies respectively, and cannot, therefore, show the relative proportions attacked among consumers of each. But it may be noted that of these eight cases six were persons residing in houses supplied with Newport water, while of the two that occurred in houses furnished with other water one is known to have drunk (unboiled) Newport water antecedent to attack. Thus, of the total number of 44 persons attacked by the fever in the Rural District near Newport 34 resided in houses supplied with Newport water, while of the remaining 10 six are known to have drunk (unboiled) Newport water; one was removed from Newport after attack, and three remain unaccounted for.

In Parkhurst Barracks and in Parkhurst Convict Prison all the persons attacked were consumers of Newport water.

There is, accordingly, a *primâ facie* case against the Newport water as concerned in the enteric fever outbreak in the Borough of Newport and its vicinity. But, if this water supply was the medium whereby fever was spread in these places, the fever should it might be contended have made its appearance in every one of the neighbourhoods to which it is supplied. From this point of view certain facts which do not appear to harmonise with the hypothesis that Newport water was the medium of fever distribution throughout the district present themselves for consideration.

The Case against Newport Water in its Negative Aspects.

Reference to the maps appended to this Report* will show that both the Workhouse and the neighbourhood of Horsbridge Hill are within the area of the Newport public water service. The Workhouse supply is derived entirely from the Newport waterworks; while, of the 39 houses at Horsbridge Hill, 29 are furnished with Newport water, and 10 are supplied from other sources. The population of the Workhouse is 300, that of Horsbridge Hill is 216. But no case of enteric fever is known to have occurred either among the Workhouse population or among persons residing at Horsbridge Hill. The value of this fact, however, as exculpatory of the public water service is materially lessened by the smallness of the populations in each instance. Entire freedom of small groups of population from attack is of frequent occurrence in epidemics of enteric fever due to water, but lasting, as in the present instance, over no very lengthened period of time. Allowance must also be made, in the case of the Workhouse, for exceptional distribution of the population as regards age. Of the 300 persons resident in this institution, 154 were over 60 years of age, while but 47 were between the ages of 5 and 15. It will be remembered that a feature of the epidemic in Newport was exceptional incidence of the disease on persons at ages 5–15, along with small incidence on persons over 35 years of age. The proportion, therefore, of persons at ages known to coincide with especial susceptibility to the fever was small in the Workhouse, and the likelihood of cases occurring there was, consequently, to a corresponding extent, diminished. But although no case of undoubted enteric fever is known to have occurred either in the Workhouse or at Horsbridge Hill, yet it is worthy of note that neither place was entirely free from illness of suspicious sort. Thus, in the Workhouse, four of the inmates were for several days confined to bed by reason of ailment described by the medical officer as "cold and fever." These four persons were attacked respectively on October 12th, October 20th, October 24th, and November 5th. In like manner, in one household at Horsbridge Hill, three persons (attacked respectively on October 20th, October 26th, and October 27th), suffered for a considerable period with symptoms which led the medical attendant to notify two of them as "doubtful enteric fever." The fact, moreover, that these cases in the Workhouse and at Horsbridge Hill occurred at the very time when the epidemic of enteric fever was at its height in Newport and its vicinity, tends to suggestion that the illness from which they suffered may well have been that mild form of enteric fever so frequently found in the course of epidemics to co-exist with the ordinary type of the disease.

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* Not here reproduced.

The comparatively small incidence of the fever on the Prison and on the Barracks, both deriving their sole domestic supply from the Newport service, also calls for comment. For this relative immunity of these establishments more than one reason may be advanced. In both places the population at ages 5–15 years is small; and the authorities of the Prison, so soon as they began to regard the water supply with suspicion, issued instructions that boiled water only should be used. In like manner boiling of water was resorted to at the Barracks and soon after the taking of this step use of the Newport water was entirely discontinued, another supply being employed in its place.

The negative aspect of the case against the Newport public water supply is not, therefore, inconsistent with this water having acted as the medium whereby enteric fever was spread throughout Newport and its vicinity. Accordingly, I now proceed to consider in more detail than I have as yet done the nature of that supply, and more particularly whether or not the surroundings of the sources whence it was derived were such as to conduce to dangerous pollution of the water.

Actual circumstances of the Newport Public Water Supply in 1894 *as regards Risk of Dangerous Pollution.*

The wells and springs from which is derived the Newport public water supply are situated, as previously mentioned, at the eastern end of the considerable village of Carisbrooke. There is a very considerable

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aggregation of houses near the waterworks; indeed, as matter of fact, the majority of the population of Carisbrooke Village reside within a quarter of a mile of these works. The greater number of the Carisbrooke houses stand on the Chalk, and the drainage of many of these houses passes into cesspools, which are so constructed as to permit leakage of their contents. The majority of these cesspools range from 6 feet to 10 feet in depth, while one is 15 feet and two are 20 feet in depth. The two latter were at one time wells from which was derived the water supply of the houses to which they are attached; they were utilised as cesspools on the Newport public water being laid on to these houses. Leakage from these two cesspools, although they lie comparatively high on the sides of the valley, would easily reach the water-line in the Chalk. Of the other cesspools not a few lie towards the bottom of the valley where the water-line of the Chalk is very near the surface, and soakage from these cesspools would readily gain access to and pollute the water in the Chalk. The general trend of the underground water in the Chalk in the Carisbrooke Valley would appear to be from the south-west to the north-east, and water flowing on this line towards the waterworks would encounter in its way some of the leaky cesspools referred to. Besides this, however, it has to be borne in mind that the effect of pumping at the waterworks would naturally be to draw thither underground water from points not in the direct line of flow towards the waterworks, and the cesspools in any wider area thus drawn upon would constitute further danger to any water supply. In addition yet another possible source of dangerous pollution of the Newport public water supply is to be found in the proximity of the mill-pond to the waterworks. In the neighbourhood of this mill-pond are several leaky cess-pit privies and cesspools; while into it flows the Lukely stream, which is at several points above the mill-pond fouled by liquid refuse from cowsheds and pigsties. On and near the banks of this stream above the mill-pond are not a few leaky cess-pit privies, while the watercloset of a house abutting on it discharges into the stream. A tenant of another house on the Lukely admitted that it was her practice to empty the excreta from her pail closet into the stream, and to wash the pail in its waters. The accompanying diagram shows the exact relation of this mill-pond and its overflows to the low-level reservoir and to the old and the new wells. It will be seen that the mill-pond is situated within 20 feet of the old well and within 50 feet of the new well; while the following measurements (taken by Mr. Baldwin Latham on November 22nd, 1894) show the different levels of pond, low-level reservoir, and wells:—

Level of water in mill-pond - - -	60·50	feet above O.D.
„ overflow of mill-pond - -	60·76	„ „
„ water in low-level reservoir - -	57·32	„ „
„ bottom of low-level reservoir -	52·95	„ „
„ top girder (near the mouth) of new well - - - -	58·75	„ „
„ top girder (near the mouth) of old well	57·09	„ „
„ water in old well - - -	53·7	„ „

The level of water in the mill-pond, therefore, is higher than that of the water in the wells and in the low-level reservoir of the waterworks, and there would be danger accordingly of pond water gaining access to these sources of supply in the absence of adequate protection against this contingency. There is, however, as I have before pointed out, no wall of puddled clay or other protective material around these wells and springs; and their sole defence against invasion by surface water from the mill-pond or elsewhere consists of the material with which they are lined. This, indeed, as regards the "new well" is by impervious iron cylinders, but for the "old well" and the low-level reservoir consists of nothing more than a layer of brickwork 9 inches in thickness. Furthermore, the brickwork that lines the "old well" is in many places very imperfect. On November 28th, the water of this well having some hours previously been lowered by pumping, I went down and examined its interior. I found that in some places the bricks with which it was lined had become so loose that they could easily be removed by the hand; that in other places bricks had dropped out; and that in several spots they had become considerably displaced and bulged into the interior of the well. I found also that water was entering the well through the brickwork in very considerable quantity, more especially on the side of the well next the mill-pond. With a view to definitely ascertaining whether or not the water from the mill-pond was gaining access to the Newport supply the following experiment was made by Mr. Baldwin Latham about the end of November 1894. After it had been ascertained that no salts of lithium were present under ordinary circumstances in the Newport water, a considerable quantity of chloride of lithium was thrown into the mill-pond at various points, and samples of water from the "new well," the "old well," and the low-level reservoir were afterwards taken at frequent intervals and examined for lithium. As a result, lithium was found in the water of the low-level reservoir and in the water of the "old well"; none was discovered in the water of the "new well." This experience, accordingly, went to show that water from the mill-pond gained access certainly to the "old well" and to the low-level reservoir. It is evident, then, that water on or near the surface of the ground might gain access to at least two out of the three sources of the Newport supply.

Further, in addition to pollution in this way from superficial soil, it appears from the facts set forth by me as to the existence of numerous cesspools within the area drawn upon by the two wells at the waterworks, that there was also serious risk of dangerous pollution of the water in the deeper strata of the Chalk which is pumped from these wells.

Results of Chemical and Bacteriological Examination of the Newport Water.

Repeated examinations, bacteriological as well as chemical, of the Newport water were made in the course of the epidemic. Chemical analysis, as not infrequently happens, failed to detect anything pointing to pollution of the supply. More definite results were obtained by bacteriological examination of various samples of water taken from all the three sources of supply. In a sample of water from the low-level reservoir the bacillus coli communis and the bacillus fluorescens putidus were found by Dr. Klein, while he also found the latter bacillus in water from the old well. In a sample of water taken early in November from a tap in Parkhurst Convict Prison (at that time supplied from the old and new well jointly) bacillus coli communis was found. In samples of water taken at the instance of the Newport Corporation on December 10th, from the new well and from the old well, the bacillus coli communis and also the bacillus of enteric fever are stated to have been found. The presence of the bacillus fluorescens putidus in the water, indeed, might be attributed either to decomposing vegetable matter or to decomposing animal matter having gained access to the supply, and is to some extent inconclusive; but the discovery of the bacillus coli communis in the water affords incontestable evidence of fouling of the supply by excreta, either animal or human. The presence of the bacillus of enteric fever in the water would of course indicate that the specific contagium of that disease had gained access to the supply.

In Appendix A. to this Report will be found detailed results of chemical analyses of the Newport water; and in Appendix B. is given a summary of Dr. Klein's Report on the bacteriological examination he made of samples of Newport water sent to him for this purpose.

Meteorological Conditions in their Relation to the Outbreak.

Careful consideration was given to possible relation between rainfall and the amount of fever prevalence in the several invaded places; but no definite connection could be made out between amount of rainfall and of subsequent fever. In Appendix C. to this Report will be found a table of daily rainfall throughout 1894.

To sum up at this stage: The evidence which has been adduced in this Report respecting the outbreak of enteric fever in Newport and its vicinity may be briefly stated thus:—

1. The fever prevailed practically throughout the whole of the area supplied with Newport water; beyond that area the epidemic did not extend.
2. In Newport and its vicinity, among conditions such as have elsewhere served as agencies in the dissemination of enteric fever, the public water supply, *and that condition alone*, was found common to all the invaded localities.
3. The physical circumstances of the sources of the implicated water supply proved on investigation such as to threaten dangerous pollution of the water service: and
4. Bacteriological examination of samples from the supply revealed the presence in the water of organisms pointing to its actual pollution by excreta of man or animals; indeed, if the result of examination of samples submitted by the Newport Corporation to independent authority be accepted, pointing to pollution of the water by the specific organism of enteric fever.

And, taken as a whole, this evidence affords the strongest possible presumption that the Newport public water supply was the agency responsible for the epidemic.

Two further points yet remain for consideration, namely, the original source of the infective material that must have gained access to the water supply, and the question as to whether more than one section, or if one only, which section of the water supply became contaminated.

Origin of the Infection and the section of Water Supply affected by it.

As regards the original source of infection the most careful inquiry failed to afford any definite information. This, however, need not be matter of wonder if regard be had to the facts that enteric fever is not infrequently unrecognised, and that on the area from which the water supply is drawn stand hotels and places of public resort visitors to which could not well be traced; and to the further fact that inquiry in this sense had to do with the circumstances of antecedent months, and therefore with circumstances which were but imperfectly remembered.

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As to the question whether one section only, or more than one section, of the Newport water had been instrumental in spreading the fever, basis for definite answer is not afforded by considerations founded on distribution of the disease. For so frequent was the distribution of high-level water to the low-level mains that it is impossible to say which was the water that transmitted the disease to the numerous cases that occurred in the low-level area; while, owing to intermixture of the waters from old and new wells before delivery into the high-level mains, it is impossible to distinguish the old well water from the new well water as regards concern with the fever. The facts as to distribution of the disease only show that, whether or not the low-level water was causative of fever, the high-level certainly was so, but whether by means of old well water or of new well water does not appear. There is, however, one piece of evidence which may be regarded as bearing on the question as to the relative shares of old and new well water in spreading the fever. This is to be found in the fact that on and after November 20th both low-level water and old well water were excluded from the Newport public service, and the water from the new well alone distributed. If the new well were at this date free from the contagium of enteric fever, this step should have been followed in about a couple of weeks by a marked decrease in the amount of fever. Reference to the chart accompanying this Report will show that in effect some decrease of the sort did come about. The value of this occurrence as evidence of absence of harmfulness of the new well water, however, is materially lessened by the fact that rapid decrease in the number of attacks had begun before the date (early December) at which this alteration in the water supply would begin to take effect. And even had this rapid decrease of fever not been taking place anterior to December it would have yet remained open to contention that sudden diminution of the disease might with equal reason be attributed to exhaustion of infected material at its source and to consequent cessation of fever dissemination by the water supply. Further, though the bacteriological evidence contained in Dr. Klein's Report tends to cast suspicion on the low-level supply, and in less degree on the water derived from the old well, it by no means absolves the new well water from suspicion; the less, since the independent report made on samples taken at the instance of the Newport Corporation would, if accepted, incriminate the new well equally with the old well.

ACTION TAKEN BY THE AUTHORITIES OF THE SEVERAL INVADED PLACES.

Newport.—On October 22nd, 1894, the Town Council resolved that a house to house inspection be made throughout the Borough: and that the water supplied to the town be submitted to chemical analysis. On October 23rd the Town Council decided to make trial of the Hermite process for dealing with sewage. On October 31st handbills were distributed from house to house throughout the Borough, urgently recommending that all water and milk intended for human consumption should be boiled. On November 2nd bills were posted throughout the town embodying a letter from Messrs. Allen and Hanbury, public analysts, to the effect that all the samples of Newport water (recently submitted to them for analysis) were "of very good quality, free from sewage or animal pollution." This bill, however, advised the boiling of water and milk to be continued. On November 3rd, in accordance with a resolution of the Town Council of the same date, all medical men practising in the Borough were requested by circular letter (accompanied by certificate forms) from the Town Clerk to "notify to the Medical Officer "of Health of the Borough, from time to time, with regard to the "existence of cases of enteric fever that come under your notice." The Town Council undertook to pay 2*s.* 6*d.* for notification of each case occurring in private practice, and 1*s.* for each case reported by a medical officer of any public body or institution. On November 16th, a resolution was passed by the Newport School Board that head teachers in the board schools be instructed to prevent children in their departments from drinking unboiled water during prevalence of the epidemic. On and after November 20th, water from the low-level reservoir and from the "old well" was excluded from the public supply, which was thereafter derived from the "new well" only.* Further samples of water were taken and forwarded for chemical and bacteriological examination on November 15th, November 30th, and December 10th. The Infectious Disease (Notification) Act, 1889, was adopted on December 4th, 1894, and came into operation on January 9th, 1895. On January 1st, 1895, the Town Council resolved to appoint an Inspector of Nuisances at an annual salary of 100*l.*, to give his whole time to the duties of that office.† On January 18th, 1895, inquiry was held by Inspectors of the Board at Newport, with reference to application from the Town Council for sanction to borrow 5,000*l.* for works of sewerage and sewage disposal, and 600*l.* for purposes of water supply. The works of sewerage and sewage disposal were in chief part concerned with the treatment of sewage at its outfall. The works of water supply consisted partly in the construction of a puddle trench to protect the existing waterworks from pollution by water in the superficial soil; partly in making survey for a suitable site for entirely new works of public water supply.

The steps taken at Newport for dealing with premises invaded by the fever were as follows:—All cases that come to the knowledge of the Medical Officer of Health were visited by him (some, however, not for a considerable time after receipt of notification, by reason of the great numbers notified); isolation of the sick in their homes was recommended in the absence of any hospital for infectious diseases in the Borough; disinfection of stools by chemical means was advised, and disinfectants for this and for other purposes were supplied free of cost by the Sanitary Authority at the Town Hall daily (except Sundays) at 2.15 p.m.; advice was given to flush house drains frequently with disinfectants; on the 31st of October the boiling of all water and milk was advised; on recovery or death of the person attacked disinfection of invaded premises was carried out, according to the estimate of the Medical Officer of Health, in some two-thirds of the cases, the measures adoped being fumigation with sulphur, and washing of floors and woodwork, and infected clothing, with carbolic soap and water. In a few instances bedding was destroyed; the Newport Sanitary Authority not possessing a disinfecting chamber. A considerable staff of nurses was employed by the Corporation to give help in attending on the sick; funds for this purpose having been obtained by public subscription.

Isle of Wight Rural District.—Every household in which enteric fever was known to have made its appearance was immediately visited by the Medical Officer of Health; isolation, as far as practicable, at home, of the person attacked, was advised in the absence of hospital accommodation for infectious diseases; contents of pails and cess-pit privies at invaded houses were treated with chloride of lime or carbolic powder, disinfectants for this and for other purposes being supplied free of charge; infected stools were mixed with chloride of lime or carbolic powder and buried in the earth in suitable position; house drains were flushed with disinfectants; advice was given that all water and milk should be boiled; all soiled linen was treated with solution of carbolic acid and subsequently boiled. After recovery or death of persons attacked, invaded premises were in some instances fumigated with sulphur, and then lime washed or re-papered, and woodwork scrubbed; in other instances fumigation was omitted, the floors and woodwork were scrubbed, and the room in which the patient had been treated was left unoccupied and freely ventilated for a week; all infected articles of a nature to permit such treatment were washed or boiled.

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* The taking of this step had been suggested about the end of October, but it was then believed that sufficient supply of water could not be obtained from the new well alone. Its sufficiency for this purpose was proved by Mr. Baldwin Latham on November 20th.

† Prior to this the duties of Inspector of Nuisances were discharged by the Borough Surveyor.

In the early part of October house to house visitation was made throughout those parts of the Rural District adjacent to Newport, and advice was given to boil all water and milk. About the same time masters of Board Schools in this quarter of the Rural District were advised by the Medical Officer of Health to supply boiled water to the children for drinking purposes and to forbid their drinking water from taps.

Parkhurst Barracks.—All cases of enteric fever in the Barracks were removed to and treated in the Barracks Hospital. On October 26th, Newport public-houses were put "out of bounds," and on November 9th Newport itself as also Carisbrooke, Shide, and other places in the vicinity of Newport were put out of bounds. On October 26th orders were given that all water used for drinking or cooking purposes should be boiled and filtered, and on October 29th the Newport supply was cut off from the Barracks and a local source of supply resorted to. On November 13th, Newport water was again made use of in consequence of chemical analysis favourable to its seeming wholesomeness, but its use was once more discontinued on November 19th. During the period November 13th to 19th, the Newport water was ordered to be boiled and filtered before use.

Parkhurst Prison.—All convicts attacked by enteric fever were removed to and were treated in the Prison Hospital wards. On October 26th orders were given that all milk and all water used for drinking and cooking purposes should be boiled. On October 30th orders were given that the water used for baking and that supplied to convicts for washing should also be boiled.

The account which has been given of the severe outbreak of enteric fever that affected Newport and its vicinity in 1894, affords illustration of the dangers that attach to a water supply derived from the Chalk when the soil of the area from which it is drawn is liable to pollution by sewage matters. The capacity of the specific contagion of enteric fever to travel afar through previous strata such as the Upper Chalk and thus to pollute even distant water supplies is well known, and it is the duty of every sanitary authority whose district is provided with water from the Chalk to see that pollution in this way is duly guarded against. In the case of the Newport supply the danger was near and pressing and the Sanitary Authority should not have required the stimulus of an epidemic which has caused widespread sickness and many deaths to spur them to the provision of a purer water for their district. Now that they have learned a lesson that they should not have needed to be taught, it is their first and most urgent duty to secure for the districts they supply ample provision of water of unquestionable purity. It is satisfactory to note that they have already taken steps to this end, and that, in addition to temporary measures for improvement of their existing waterworks, they are looking elsewhere for a supply of water which shall not be exposed to risk of dangerous pollution of the kind that in 1894 affected their present sources and that remains liable to again affect these in like manner. The Town Council are also proposing to deal adequately with the sewage of their Borough at its outfall and in this way to effect a much needed improvement of the sewerage system. Other matters in Newport requiring their attention are provision of proper ventilation and means of flushing of the older sewers, reconstruction of many house drains and disconnection of these from sewers, disconnection of interiors of houses from drains, and provision in all instances of good patterns of waterclosets with proper means of flushing them.

In those parts of the Isle of Wight Rural District that were invaded by the fever the matters chiefly requiring the attention of the Authority are the sewering of the village of Carisbrooke and abolition of the cesspools and offensive open gutters there. The method of excrement disposal at Carisbrooke and the other invaded places is also open to considerable improvement.

APPENDIX A.

CHEMICAL ANALYSES of SAMPLES of WATER from the NEWPORT PUBLIC WATER SUPPLY.

Report on three samples of water from the Newport Waterworks, received on November 5th, 1893. No. 1 was taken from the "New Well"; No. 2 from the "Old Well"; and No. 3 from the Low-level Reservoir.

——	No. 1.	No. 2.	No. 3.
Colour in 2 ft. tube	Pale blue clear.	Pale blue clear.	Pale blue clear.
Suspended matter	None	None	None
Smell when heated to 100° F.	"	"	"
Taste	"		"
Hardness before boiling	11°	11°	11°
" after "	3°·5	3°·5	3°·5
	Grains per gallon.	Grains per gallon.	Grains per gallon.
Total solid matter	21	21	20·30
Loss on ignition	2·7	3·5	4·9
Total mineral matter	18·3	17·5	15·4
Chlorine as sodium chloride	3·44	3·44	3·44
Lead, copper, and iron	None	None	None
Phosphoric acid	"	"	"
Nitrogen as ammonia	·0018	·0016	·0007
" as albuminoid ammonia	·0005	·0005	·0005
" as nitrates	·2912	·2484	·3718
Oxygen absorbed from permanganate of potash at 80° F. in 2 minutes	None	None	None
Oxygen absorbed from permanganate of potash at 80° F. in 4 hours	·0241	·0126	·0126
Valuation—Wigner's scale	20	22	18

Remarks.

No. 1.—Is a very good water, it is free from pollution with sewage, in fact the organic matter is extremely small; it compares favourably with the purest chalk water, and is excellent for drinking and dietetic purposes.

No. 2.—Is a first-class water, the absence of organic matter shows that it is quite free from sewage or drainage contamination, and coincides with pure water. It is an excellent supply for drinking.

No. 3.—This water is very satisfactory; evidently the gathering ground supplying the surface spring is not in any way contaminated with organic matter. Both the chemical and microscopical examinations are satisfactory.

It is a pure supply and excellent for drinking. The samples are very much the same in character, and would appear to be derived from a similar source.

(Signed) Allen and Hanbury, Limited.

November 15, 1893.

Report on six samples of water received from the Borough Surveyor of Newport, on October 25th and 27th, 1894. Nos. 1, 2, 3, and 4 are waters taken from taps or hydrants in different parts of the Borough; No. 5 is from the "New Well"; No. 6 is from the "Old Well."

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Colour when examined in a tube 2 feet long.	Pale blue clear.	Pale blue clear.	Pale blue.	Pale blue clear.	Opaque	Greenish blue clear.
Suspended matter	None	Trace	Very heavy.	Trace	Heavy flocculent.	Trace
Smell when heated to 100° F.	"	None	None	None	None	None
Taste when heated to 100° F.	"	"	"	"	"	"
Temporary hardness	13·7	14·0	14·0	11·9	13·7	13·9
Permanent hardness	4·0	4·0	4·2	3·5	3·5	4·0
	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.
Total solid matter	29·00	28·70	25·90	22·40	20·30	24·50
Loss on ignition	8·00	7·00	3·50	3·50	2·10	4 20
Total mineral matter	21·00	21·70	22·40	18·90	18·20	20·30
Chlorine	2·40	2·20	2·30	2·30	2·20	2·20
" equal to chloride of sodium	3·93	3·60	3·76	3·76	3·60	3·60
Lead and copper	None	None	None	None	None	None
Iron	"	"	"	"	"	"
Phosphoric acid	Faint trace.	"	Trace	"	"	"
Nitrogen as free ammonia	·0033	·0030	·0008	·0013	·0022	·0008
" as albuminoid ammonia	·0017	·0005	·0027	·0021	·0017	·0017
" as nitrates	·3350	·5060	·6000	·5000	·4500	·4250
Oxygen absorbed by organic matter from solution of permanganate of potash at 80° F. in 2 minutes.	None	None	None	None	None	None
Oxygen absorbed by organic matter from solution of permanganate of potash at 80° F. in 4 hours.	·0364	·0224	·0120	·0364	·0364	·0504
Valuation—Wigner's scale	30	28	33	27	35	29
Values below 35 indicate first-class water						
The London waters generally average a value of about 30, and the best public supplies 10 to 15.						

(Signed) Allen and Hanbury, Limited.

November 2, 1894.

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APPENDIX B.

Results of Bacteriological Examination by Dr. Klein of certain Samples of Water from the Newport Public Supply.

Four samples were submitted to Dr. Klein for examination. They were as follows:—

Sample A. from the New Well, taken November 21st and 22nd, 1894.
„ B. „ Old Well „ 22nd.
„ C. „ Low-level Reservoir „ 22nd.
„ D. „ Old Well „ 28th and 29th.

Summary of Dr. Klein's Report.

Samples A., B., and C. were received on November 23rd; Sample D. on November 30th. Each sample consisted of a gallon of water contained in two Winchester quart bottles. Waters A., B., and C. were limpid; water D. was slightly turbid.

The following was the method of examination adopted in each instance: 2,260 c.c. of the sample were passed through a sterile Berkefeld filter, and the matter retained on the outer surface of the filter was then brushed with a sterile brush into 10 c.c. of sterile water and mixed therewith. Of this mixture 1 c.c. was added to each of six phenolated gelatine plates, so that each plate received the particulate matter of 226 c.c. of the original water. In this way all, or nearly all, of the particulate matter of 1,356 c.c. of each sample was submitted to examination. The nature of the colonies that appeared on the gelatine plates was in each instance determined by miscroscopic observation, and by sub-culture in several media.

The results of examination of the four samples were as follows:—

In Sample A., in addition to the ordinary water bacteria, one colony was observed which presented a suspicious appearance. On miscroscopic examination and sub-culture, however, it was ascertained to be neither the bacillus coli communis nor the bacillus of enteric fever.

In sample B a good many colonies of proteus vulgaris were observed in addition to the ordinary water bacteria.

In Sample C., besides ordinary water bacteria, there were observed protous vulgaris, bacillus fluorescens putidus, and a few colonies of a gas-forming bacillus belonging to the bacillus coli group.

In Sample D., in addition to the ordinary water bacteria, the bacillus fluorescens putidus was observed. There was also great abundance of proteus vulgaris in this sample.

The bacillus of enteric fever was not found in any sample.

APPENDIX C.

Register of Rainfall in 1894. Kept at Newport, Isle of Wight, by the Rev. E. W. Watts, Lugley House, Newport.

The amount of Rainfall is recorded in inches.

Day of Month.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	—	0·06	0·34	—	—	0·4	0·11	0·04	—	—	0·30	—
2	—	0·29	—	—	0·10	—	0·02	0·17	0·75	—	0·02	—
3	—	—	—	—	0·01	0.4	—	—	0·02	—	0·21	—
4	0·02	0·01	0·01	—	—	0·01	—	0·01	—	—	—	0·07
5	0·2	0·3	0·08	0·05	—	—	—	0·01	0·02	0·02	0·14	—
6	—	0·01	—	—	—	0·34	—	—	—	0·05	0·03	0·02
7	—	—	0·17	—	0·04	—	—	0·09	0·95	—	0·49	0·33
8	0·5	0·02	0·18	—	—	0·1	0·43	0·05	—	—	0·13	—
9	0·35	—	0·14	—	0·21	—	—	—	—	0·01	0·15	—
10	0·04	—	—	—	0·09	—	1·14	—	—	—	0·12	0·02
11	0·2	0·02	0·05	0.03	0·45	0·01	0·10	—	—	—	2·44	0·37
12	0·05	0·01	0·27	—	—	0·21	0·03	0·20	—	—	0·60	—
13	0·04	—	0·04	0·10	—	—	0·30	0·01	—	—	0·36	0·20
14	0·24	0·01	0·85	0·27	—	—	—	—	—	—	1·15	0·36
15	0·46	—	—	0·25	0·10	0·09	0·04	—	—	—	0·46	0·06
16	0·19	0·1	—	0·27	0·02	—	0·20	0·01	—	—	0·17	0·08
17	0·13	0·91	—	0·02	—	0·02	0·03	—	—	—	—	0·20
18	—	—	—	0·02	—	0·15	0·01	—	—	—	—	0·16
19	0·21	—	—	—	—	0·01	0·15	—	—	—	—	—
20	—	—	—	—	—	0·15	0·45	—	0·09	0·25	0·17	—
21	0·5	—	—	—	—	—	0·01	0·10	0·24	0·10	—	0·18
22	0·72	—	—	0·02	0·14	—	0·05	0·38	0·35	0·22	—	—
23	—	0·32	—	0·01	0·01	0·01	—	0·16	0·01	0·29	—	0·43
24	0·12	—	—	0·53	—	—	0·13	0·25	0·18	0·52	—	—
25	0·82	0·23	—	0·13	—	—	0·03	0·15	0·81	0·09	—	—
26	0·01	—	—	0·01	—	—	—	—	—	1·69	—	0·08
27	0·2	0·36	—	0·01	—	—	0·02	—	—	0·28	—	—
28	—	0·04	—	—	0·01	—	0·75	—	—	0·18	—	0·06
29	0·14	—	—	0·10	—	—	0·90	—	—	0·83	—	—
30	0·34	—	0·08	0·19	0·03	—	0·01	—	—	0·69	—	—
31	0·06	—	0·01	—	0·01	—	0·05	—	—	0·04	—	—

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App. A. No. 6.

On Enteric Fever in Newport, I.W.; by Dr. Theodore Thomson.

APPENDIX C.

REGISTER of RAINFALL in 1894. Kept at NEWPORT, ISLE OF WIGHT, by the REV. E. W. WATTS, Lugley House, Newport.

The amount of Rainfall is recorded in inches.

Day of Month.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	—	0·06	0·34	—	—	0·4	0·11	0·04	—	—	0·30	—
2	—	0·29	—	—	0·10	—	0·02	0·17	0·75	—	0·02	—
3	—	—	—	—	0·01	0.4	—	—	0·02	—	0·21	—
4	0·02	0·01	0·01	—	—	0·01	—	0·01	—	—	—	0·07
5	0·2	0·3	0·08	0·05	—	—	—	0·01	0·02	0·02	0·14	—
6	—	0·01	—	—	—	0·34	—	—	—	0·05	0·03	0·02
7	—	—	0·17	—	0·04	—	—	0·09	0·95	—	0·49	0·33
8	0·5	0·02	0·18	—	—	0·1	0·43	0·05	—	—	0·13	—
9	0·35	--	0·14	—	0·21	—	—	—	—	0·01	0·15	--
10	0·04	—	—	—	0·09	—	1·14	—	—	—	0·12	0·02
11	0·2	0·02	0·05	0.03	0·45	0·01	0·10	—	—	—	2·41	0·37
12	0·05	0·01	0·27	—	—	0·21	0·03	0·20	—	—	0·60	—
13	0·04	—	0·04	0·10	—	—	0·30	0·01	—	—	0·38	0·20
14	0·24	0·01	0·35	0·27	—	—	—	—	—	—	1·15	0·36
15	0·46	—	—	0·25	0·10	0·09	0·04	—	—	—	0·46	0·06
16	0·19	0·1	—	0·27	0·02	—	0·20	0·01	—	--	0·17	0·02
17	0·13	0·91	—	0·02	—	0·02	0·03	—	—	—	—	0·20
18	—	—	—	0·02	—	0·15	0·01	—	—	—	—	0·16
19	0·21	—	—	—	—	0·01	0·15	—	—	—	—	—
20	—	—	—	—	—	0·15	0·45	—	0·09	0·25	0·17	—
21	0·5	—	—	—	—	—	0·01	0·10	0·24	0·10	—	0·18
22	0·72	—	—	0·02	0·14	—	0·05	0·38	0·35	0·22	—	—
23	—	0·32	—	0·01	0·01	0·01	—	0·16	0·01	0·29	—	0·43
24	0·12	—	—	0·53	—	—	0·13	0·25	0·18	0·52	—	—
25	0·82	0·23	—	0·13	—	—	0·03	0·15	0·81	0·09	—	—
26	0·01	—	—	0·01	—	—	—	—	—	1·69	—	0·08
27	0·2	0·36	—	0·01	—	—	0·02	—	—	0·28	—	—
28	—	0·04	—	—	0·01	—	0·75	—	—	0·18	—	0·06
29	0·14	—	—	0·10	—	—	0·90	—	—	0·83	—	—
30	0·34	—	0·08	0·19	0·03	—	0·01	—	—	0·69	—	—
31	0·06	—	0·01	—	0·01	—	0·05	—	—	0·04	—	—

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No. 7.

App. A. No. 7.

On an Outbreak of Anomalous Illness at Laxfield; by Dr. Bruce Low.

REPORT on an OUTBREAK of ANOMALOUS ILLNESS characterised chiefly by BRONCHO-PNEUMONIA and SORE-THROAT in the Parish of LAXFIELD, SUFFOLK; by DR. R. BRUCE LOW.

ON April 14th, 1894, the Local Government Board received a letter from Dr. Charles Biden, a medical practitioner at Laxfield, to the effect that a somewhat extensive outbreak of acute illness, among children, had appeared in that parish. At the time of writing, Dr. Biden had knowledge of some 20 households having been invaded, yielding 37 cases. The description he gave of the prevalent malady resembled very closely that occurring as an epidemic at Raunds in Northamptonshire in 1891. Under these circumstances I was instructed to visit Laxfield at an early date, with a view to obtaining information as to the nature of the current illness, and the conditions under which it was prevailing.

In the course of my investigations, which commenced on April 17th, I had the assistance of Dr. Smart, the Medical Officer of Health of the Sanitary District in which Laxfield is situated, and of Dr. Biden, the resident medical practitioner, to both of whom my thanks are due.

TOPOGRAPHY.

Laxfield, a parish in the Rural Sanitary District of Hoxne, had at the last census a population of 905; the number of inhabited houses was 208, and the area of the parish 3,719 acres. Rather less than half the population of this wide parish is distributed in scattered farms and cottages, and the remainder in the village itself, which consists, roughly speaking, of a single broad main street running almost due east and west. The River Blythe rises in the parish, and while yet a small brook, skirts the lower end of the main street of the village. The highest point of the village is 162 feet above Ordnance Datum. The locality is generally known as a part of "High Suffolk," and is situated at a distance of about 12 miles from the coast. Geologically the parish lies upon Boulder Clay. The people are employed in agriculture.

SANITARY CIRCUMSTANCES OF LAXFIELD.

The *Water Supply* of outlying houses is chiefly derived from private wells, of no great depth; but for the village itself surface water from adjoining fields is collected in a deep pond or reservoir, situated at the higher end of the village, and adjoining the high road, whence it is conveyed by a pipe to a filter bed consisting of layers of charcoal, sand, and gravel, to a depth of 3 feet. The filter bed is 6 feet long by 2 feet wide, and there is usually a column of 3 feet 5 inches of water standing on the filter bed. The water after passing through this filter bed is piped to a well or tank, situate near the middle of the village, and provided with a pump. The villagers have to fetch from this pump what water they require for domestic use. At the date of my first visit, April 17th, the filter bed had not been cleaned out, or the materials renewed, for the last two years. This has, however, since been done. The water supply ran short last year during the summer months. There is no proper *sewerage*. Some drain pipes are laid behind houses to convey away slop water, which finds its way sooner or later into the brook. *Excrement disposal* is by means of cesspit privies emptied at long intervals. *Refuse disposal* is by means of uncovered ashpits, often little better than holes dug in the backyards. The contents of these ashpits are from time to time disposed of upon garden land or allotments by the occupier. *The dwellings*, which generally have plenty of open space about them, are fairly good. Some are of antiquated construction with thatched roofs. A few are damp. Sometimes spouting is defective or altogether wanting. The interiors of cottages were found as a rule clean, tidy, and fairly well ventilated, though here as in other rural districts there is often noticed a reluctance to properly ventilate bedrooms by opening the windows during the daytime.

THE OUTBREAK.

By the time I reached the village on April 17th the bulk of the cases had passed through the acute stage of the disease. Consequently the amount of clinical material at my disposal was somewhat limited. But with the assistance of the Medical Officer of Health, Dr. Smart, who practises in the locality, the help from Dr. Biden, who had attended the majority of the cases, and the evidence obtained by my own inquiries at invaded houses, I was able to gain information as to the symptoms and general course of the illness as manifested in the majority of the patients.

The ailment had been, it appeared, practically confined to children, and the first symptom usually observed in them was *vomiting*. In a few infants there was an initial convulsion. Then followed *drowsiness*. In some cases this was a very marked symptom and some mothers told of children who had slept almost continuously for three days. *Fever* was noticed at the onset; the skin felt hot and there was flushing of the face. Temperature, however, was not, in any of the cases in which it was taken, found to exceed 103°. *Respiration* was hurried and *difficult*, with conspicuous movements of the alae nasi. *Cough* was an invariable symptom. Older children complained of *sore-throat;* pain and difficulty in swallowing was observed in infants. A large number of the cases had *diarrhœa;* the motions are stated to have been offensive, green at first, afterwards light in colour. *Headache* was a common symptom. Some children when asked where they felt pain, placed their hand at the back of the head and neck. In some older children there was *delirium* and in several infants distinct *retraction of the head* is stated to have been observed. *Epistaxis* occurred occasionally during convalescence, and many had *profuse sweating*. Most of the cases had *enlarged cervical glands* and a number had *herpes of the lips*. The majority of those attacked had some *discharge from the nose and from the eyes*. In a few cases the conjunctivæ were injected, some children complained of *earache*, and in a few cases an *ear discharge* followed.

Lung complication was not uncommon. All varieties were found, from simple bronchial catarrh to acute bronchitis and broncho-pneumonia.

From my note-book I take the following description of a group of cases in a particular household. It is a fair sample of other groups.

A. O., aged three, became ill on April 11th. She was not noticed to vomit, but she slept so much in school that the mistress sent her home. She had headache, cough, fever, and diarrhœa. Her sister, aged five, was taken ill two days later (April 13th) in a similar way. Her cough was said at first to resemble whooping cough. After a smart epistaxis she recovered. The baby of the family, aged eight months, vomited on April 19th; he had fever, cough, difficulty of breathing, flushed face, diarrhœa, marked drowsiness, and fits of screaming when he waked; he appeared to have pain in his neck, as he kept putting up his hand to the back of his head. His head became retracted. Dr. Biden says this symptom passed off after the application of a mustard plaster to the nape of the neck. His tongue was observed to be brown. The child remained dangerously ill for about seven days, and then made a rapid recovery. After he passed the seventh day he had profuse sweating, the moisture, so his mother says, "dropped from his face" at times. While this child was ill, his mother had sore-throat and some hoarseness for four days. She also had diarrhœa. A few days later the father had cough, diarrhœa, and headache, with profuse sweating.

In only three cases, all occurring in another and different family, was a rash observed. Five children of this second household were attacked by similar symptoms one after the other. The first, a girl aged seven, began to be ill on April 9th. She had vomiting, cough, diarrhœa, headache, sore-throat, and fever. On April 11th, a rash came out on her face, and afterwards on her arms and back. The eruption was red like scarlatina, but was in patches. There was later on a white powdery state of the skin in places. Along with the eruption there appeared injection of the conjunctivæ; running from the eyes; the breathing was hurried; she complained of dizziness; the cervical glands were enlarged. Her mother says this girl cried out a good deal in her sleep during the illness. She had chest symptoms which lasted about three weeks. Her wrist joints became swollen and painful during convalescence. On April 14th, her sister, aged four, became ill in precisely the same way, viz., vomiting, cough, diarrhœa, a patchy red rash, and redness of the eyes with a discharge from them. Two days later, April 16th, a third girl, aged five, began to be ill in the same way with sickness, diarrhœa, cough, a red eruption in patches like the others. She was drowsy; her mother says it was with difficulty she could be waked up. Her mouth was sore (stomatitis). During convalescence this girl's wrists also became swollen and painful, and her skin showed a white powdery sort of desquamation. A fourth girl, aged nine and a half, was attacked on April 27th with precisely the same symptoms mentioned above, except that this girl had no rash; she had troublesome delirium, and there was marked hyperæsthesia of the skin. She had considerable fever, with shortness of breath, and she complained of pain in the side. She was still ill when I saw her on May 8th. The temperature on that day was 102°, and there were coarse rales over the whole back part of the chest. I did not detect any dullness. She had ulcers on her tongue and inside her lips (stomatitis), and she had become considerably emaciated. Her cervical glands were enlarged. The next child attacked in this household was a boy aged three. He began to be ill on May 4th with the usual symptoms, vomiting, diarrhœa, cough, and fever. He had a crop of herpes on his lips when I saw him on May 8th, but his temperature had become normal. He had no red rash; his cervical glands were enlarged. During the last week in April both the father and the mother of this family had sore throats, with cough and headache. The father also complained of aching in his back. Dr. Biden, who attended this family, says that several of these children while they were ill "held their heads back" (retraction?) in a peculiar way. They all had swelled necks, and all had discharge from the eyes. Only one member of this family escaped so far as could be ascertained, viz., the youngest, a girl aged 14 months. None of them are known to have had scarlet-fever previously, but the five children who were now attacked had measles two years ago.

[I have described these cases for the reason that a rash resembling scarlatina was observed in several cases in the Northamptonshire outbreak of 1891, referred to at the beginning of this report; and for the reason also that an eruption was noticed in several isolated cases in two other villages in the Hartismere Rural Sanitary District, where a similar outbreak of illness among children recently occurred in the practice of Dr. Barnes of Eye.]

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The following description of one of the fatal cases was given to me by Dr. Biden, along with the others, which were in nearly all respects similar:—

F. S., aged 10 months, was taken ill on April 7th. Three other children in this house had vomiting, diarrhœa, and cough while this baby was ill. He had vomiting, drowsiness, fever; temperature, 103°; flushed face, hurried breathing with movements of the alae nasi, cough, fits of screaming, diarrhœa, the stools at first being greenish in colour. The conjunctivæ were injected, and there was a nasal discharge. Later on there was a running from one ear. The cervical glands were enlarged. He developed retraction of the head, muscular twitchings, and convulsions; he died comatose on April 14th. In this infant there appeared to be hyperæsthesia of the skin; and this was a circumstance that was remarked upon by several of the mothers, viz., that when they went forward to the cradle the child in each instance cried out in terror "as if," so the mothers themselves suggested, "the child was afraid of being touched."

With the assistance of Drs. Smart and Biden, I collected altogether a list of 32 houses in Laxfield parish invaded by illness of the foregoing sort, and in these families the total number of children attacked numbered 66, of whom six died. In addition to the children's attacks, there were several cases of concurrent illness among adults in the same households. The number of adults so affected that came under my notice was 12. But this number can hardly be said to cover all such cases; nor do the 66 cases among children in the parish represent, in my opinion, all the illness that occurred in April at Laxfield as a result of the outbreak. I heard indirectly of cases where no medical attendance had been sought, and where the illness had been regarded as "a cold," or an "influenza," or, in some few cases, owing to the character of the cough, as "commencing whooping cough."

The families attacked were not confined to any one class. The children of farmers, tradesmen, and labourers suffered alike. The first case noted occurred on March 30th. The patient, aged three, was the son of a charwoman in the village, but I have reason to believe that this was not the starting point of the Laxfield outbreak. In Table I. the progress of the epidemic week by week in April can be followed:—

TABLE I., showing the NUMBER of HOUSEHOLDS in LAXFIELD PARISH ascertained to have been INVADED by the EPIDEMIC ILLNESS, week by week in April 1894, with the NUMBER of SUBSEQUENT CASES and the DEATHS.

——	Households invaded.	Subsequent Cases.	Total Cases.	Cases ultimately Fatal.
Households ascertained to have been invaded during week ending—				
April 1st - - -	1	—	1	—
April 8th - - -	18	25	43	4
April 15th - -	10	9	19	1
April 22nd - - -	3	—	3	1
April 29th - -	—	—	—	—
Total - -	32	66	66	6

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The number of cases in households was as follows :—

In each of 3 households there were 5 recognised cases = 15
„ 3 „ „ 4 „ „ = 12
„ 4 „ „ 3 „ „ = 12
„ 5 „ „ 2 „ „ = 10
„ 17 „ „ 1 „ „ = 17
„ 32 „ „ „ „ = 66

There are 113 houses in the village proper; of these 14 were known to have been invaded, yielding 32 cases; in the outskirts or outlying parts of the parish there are 95 houses, and of these 18 were ascertained to have been invaded, yielding 34 cases.

As has been already noted, the illness was almost entirely confined to children. The following Table (II.) shows the age and sex of persons attacked by the epidemic malady :—

TABLE II., showing AGE and SEX of the RECOGNISED CASES of EPIDEMIC ILLNESS and of the FATAL CASES at LAXFIELD in April 1894.

—	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
Under six months	2	2	4	1	—	1
Six months to 12 months	9	1	10	1	—	1
1 year to 2 years	6	1	7	3	—	3
2 years to 3 years	3	2	5	1	—	1
3 „ to 4 „	5	5	10	—	—	—
4 „ to 5 „	2	4	6	—	—	—
5 „ to 10 „	6	15	21	—	—	—
10 „ to 15 „	2	1	3	—	—	—
15 „ to 25 „	—	—	—	—	—	—
25 „ to 40 „	—	—	—	—	—	—
40 „ to 60 „	—	—	—	—	—	—
60 and upwards	—	—	—	—	—	—
Totals	35	31	66	6	—	6*

It is a curious circumstance that the fatal cases all occurred among young males under three years of age. Girls of school age show a larger proportion of attacks than boys of the same age.

Of the 66 observed attacks included in the epidemic, I have information from the medical attendant that 23 had definite symptoms, more or less, of pneumonia or broncho-pneumonia. The majority of the remainder had some fever, and more or less bronchitis with the other symptoms, such as diarrhœa and sore-throat.

As to the ages of first-noted cases in their respective families, I have given in Table III. the facts for the 32 Laxfield households which were known to have been invaded during the four weeks ending April 22nd.

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* The last fatal case was a child 15 days old. He was a strong and vigorous child when born. His father, mother, brother, and sisters had been ill the week after the infant was born. He had a cough and became convulsed, his illness being, in the opinion of Dr. Smart and of the parents, the same as that from which the other children in the house had been suffering.

TABLE III., distinguishing AGES of FIRST CASES of the EPIDEMIC ILLNESS in invaded FAMILIES at LAXFIELD, and of SUBSEQUENT CASES during the four weeks ending April 22nd, 1894.

Age-Period.	First Attacks in Families.	Subsequent Cases.	Total.
Under 1 year	9	5	14
1 year to 2 years	5	2	7
2 years to 3 years	2 } 21	3 } 21	5 } 42
3 " to 4 "	4	6	10
4 " to 5 "	1	5	6
5 " to 10 "	9	12	21
10 " to 15 "	2	1	3
15 " to 25 "	—	—	—
25 " to 40 "	—	—	—
40 " to 60 "	—	—	—
60 and upwards	—	—	—
Totals	32	34	66

Much reliance, however, can hardly be placed upon these figures, since mild cases in older children were passed over in certain instances, and only the severe attacks in infants brought the occurrence of the malady under notice.

The 23 cases which showed the graver pneumonic symptoms were nearly all young infants :—eleven were under 1 year of age; seven were between 1 and 2 years; one was between 2 and 3 years; two between 3 and 4 years; one between 4 or 5 years; and, lastly, only one between 5 and 10 years of age. So that of the 22 cases stated to have shown distinct pneumonic symptoms, 22 *were under 5 years of age*, and only one above that age. These figures show that the epidemic was distinctly more severe in infants than in children of school age, and, as has been mentioned, all the six fatal cases were under three years of age.

Though the cases began to multiply quickly in the first week in April, it was not till about the 13th of the month that Dr. Biden was able to feel sure that he had to deal with a communicable disease, and it was then that he wrote to inform the Board. Under date April 14th, Dr. Biden, who is a district medical officer of the Hoxne Union, entered in the margin of his medical relief book the following note :—"The "numerous cases of pneumonia, occurring during the past fortnight " amongst infants in the parish, amount almost to an epidemic." On looking over the entries in his medical relief book I found Dr. Biden had entered cases of acute illness during the fortnight: two as "broncho-pneumonia" (aged respectively 10 months and 12 months), one as "pneumonia" (aged 18 months), and one as "febricula" (aged 9 years); but the bulk of his cases were in his private practice, as also were those of Dr. Smart, who attends patients in and around Laxfield, though residing some miles distant. It appears that the fact of Dr. Biden having reported the outbreak to the Local Government Board gave umbrage to the Rural Sanitary Authority, who thought that this gentleman should have first notified the epidemic to them, and allowed their own Medical Officer of Health to make a preliminary investigation. Dr. Biden, however, assures me that he meant no discourtesy to the local authority; he thought, he says, that his note in the medical relief book, which I have just quoted, was a sufficient notification, since the Guardians were also the Rural Sanitary Authority. Moreover, he considered the outbreak of such importance and interest that he was anxious to get assistance from the Central Authority without any delay, with a view of ascertaining if possible the precise nature of the epidemic malady, the more so as it appeared to be a disease which he had not previously seen during the years he has been in practice.

THE EFFECTS OF THE EPIDEMIC ON SCHOOL ATTENDANCE.

During my investigation I obtained from the school teachers in Laxfield some information as to facts observed by them regarding the epidemic illness. There are two public elementary schools, viz. : one for boys and one for girls, situated in two distinct parts of the village. Both schools closed for the Easter holidays on March 22nd and re-opened on Monday, April 2nd. The following Table (IV.) gives the facts as to the average daily attendance at each school during the successive weeks in April, *i.e.*, during the epidemic period. Infants are also received at each school.

TABLE IV., showing the average DAILY ATTENDANCE for each WEEK in APRIL at the LAXFIELD BOYS' and GIRLS' SCHOOLS.

——	Boys.	Girls.
Number of children on the books - - - -	87	99
Average daily attendance for last completed year -	74	90
Average daily attendance for week ending April 6th -	70·3	85·0
" " " " 13th -	66·0	66·0
" " " " 20th -	68·1	66·0
" " " " 27th -	67·2	66·7
" " " May 5th -	75·3	81·0

The master of the boys' school says that he resumed work on Monday, April 2nd, with an attendance of 73, but by Friday following this had dropped to 66. He tells me that, during the three succeeding weeks, there was an excessive amount of coughing in the school, that on several occasions boys had to go outside to vomit, and that one was taken home in a fainting condition. Cases of "breaking out" upon the lips (herpes) had been noticed by him.

The effects of the epidemic were, however, felt with more severity at the girls' school, and particularly among the infants. The logbook of that school under date April 13th contains an entry, "Many children "are absent on account of bronchitis." And later on it is stated, "Several away with sore-throat." During April cases of epistaxis occurred in the school, and some girls and infants were seized with vomiting while at their studies. Several were sent home on account of persistent drowsiness. The mistress received messages from the mothers respecting some absentees to the effect that the children were at home suffering from "coughs and sore-throat." When I visited the girls' school on April 17th there was a large amount of coughing going on. Some children showed traces of herpes of the lips, and some looked pale and weak. When I revisited both schools on May 8th the coughing had almost disappeared, and the pupils looked brighter and healthier than upon the previous occasion.

OCCURRENCE OF SIMILAR ILLNESS IN NEIGHBOURING DISTRICTS.

Having ascertained the nature of the symptoms generally observed in a large number of cases at Laxfield, I next endeavoured to discover if any similar illness had been prevalent in neighbouring districts. For this purpose I saw personally, or communicated by letter with, some 11 medical men residing and practising in the localities in and around the Hoxne Rural Sanitary District. Three of these gentlemen were Medical Officers of Health. The others were private medical practitioners and district medical officers. From Mr. Morris, medical officer of health for the Blything Rural Sanitary District, and from Dr. Cordy Keer, the medical officer of health for the Plomesgate Rural Sanitary District, the evidence was negative. From Dr. Edgar G. Barnes, of Eye, medical officer of health for the Hartismere Rural Sanitary District, a gentleman of large private and consulting practice and an experienced observer, I gained the following information under date May 4th. He had at that time in his practice, and in the parish of Occold (population 514), situated 8 miles due west from Laxfield, a very similar outbreak to that which I had described to him as having occurred in the latter place. He and his assistant (Mr. Elystan Jenkins) had attended 14 such cases in Occold, and he had heard of at least seven other cases believed to have been of the same nature. He had also on the day he wrote me (May 4th) come across 16 cases of what appeared to be the same illness at Bacton (population 646), situated about 15 miles south-west of Laxfield, and about 8 miles from Occold. In Bacton he had heard of some eight or ten other cases, besides the 16 he himself had seen. Dr. Barnes was good enough, in response to my request, to furnish me with the following resumé of the symptoms noted in the Occold and Bacton cases. "It prevails," says Dr. Barnes, "exclusively among children, and I think I may add, children under 10 "years of age. Vomiting was present in a few cases. Fever invariably "present; highest observed temperature 102·6°. Sore-throat present in "several cases, but by no means invariable. Cough always present and a "prominent symptom. Broncho-pneumonia in some cases. Diarrhœa "not noticeably present. Enlargement of the cervical glands frequently "present; sometimes a chain of glands posterior to the sterno-mastoid "such as is found in rötheln. Ear discharge observed in one case at "Occold and in one at Bacton. No case has been fatal, but several "have caused anxiety. Retraction of the head was not noticed." Dr. Barnes goes on to say he had observed a rash, in one case, of circular spots, isolated, rose-coloured, and this had been diagnosed as rötheln. He also mentions that he has had two or three isolated cases with rashes recently, and these he regarded as rötheln. In his cases at Occold and Bacton there was headache, severe, and almost invariable; aching of limbs was not so common. The duration of Dr. Barnes's cases is said to have been generally about two to three days, and recovery was rapid usually. The tongue, he states, was slightly coated, with prominent red papillæ. Dr. Barnes's cases, though apparently of a milder type than those which occurred at Laxfield, seem to have been instances of the same disease which has been recently epidemic in the latter place.

Upon calling on Dr. Vernon, a medical practitioner residing and practising at Framlingham, about seven miles due south from Laxfield, I was informed that in his own two children he had observed something very similar to what I had described to him. As the symptoms in these two cases were medically observed throughout I shall state them here.

On Sunday, April 22nd, Dr. Vernon's son, aged 8 months, was taken ill. He had vomiting, restlessness, and fits of screaming. His face was flushed, his temperature on the second day was 103°. He had cough, and apparently sore-throat, for he winced when he tried to swallow, and had some difficulty in taking his food. His breathing was hurried, and there was movement of the alae nasi. He had some scattered small spots on his skin, but they soon disappeared. Towards the latter part of the illness he had diarrhœa, though usually he suffered from constipation. His father says he noticed retraction of the head, and that at times there were muscular twitchings. Also he states that there was some dullness at the base of both lungs, with coarse râles over the whole chest. The infant had a very severe attack, and his life was in great danger for two or three days. He is now convalescent.

Some two or three days before this baby was taken ill, the only other child of the family, a girl aged 4 years, was observed to be out of sorts. She vomited and had diarrhœa; she had a cough, and some running from the nose. She complained of earache and of headache. She was very drowsy for several days, and she had herpes of the lips. Dr. Vernon, upon inquiry, informed me he remembered attending, previous to the illness of his own children, members of a family in a village only 3½ miles from Laxfield for a similar train of symptoms. These cases, from his account, were probably of the same nature as those already described.

Dr. Drew, of Framlingham, told me that until within the last few weeks, he had not had for some time much illness in his district; but that recently he had become very busy, the majority of cases being "colds and chest affections" in children. He says the most frequent symptoms were "fever, flushing of the face, loss of appetite, furred " tongue, and earache (with suppuration in a few cases), cough, and " slight chest troubles. No fatal cases, no rash, no diarrhœa (con- " stipation was common), and no meningeal symptoms." He noticed no herpes of the lips, nor was sore-throat a common symptom. He regarded the above symptoms as suggesting, perhaps, influenza. His own son, aged 5 years, had been ill; on April 6th, among other symptoms, he complained of severe headache, which he referred to the back of his head and his neck. This boy's temperature for a day or two was 102·6°, and he had enlarged cervical glands. He had sore-throat and some bronchial symptoms.

Dr. Smart, of Fressingfield, the medical officer of health for the Hoxne Rural Sanitary District, tells me he has had in his practice for some weeks back a general prevalence of catarrhal illness among children. In a letter, dated April 24th, he informs me that in two of the churches in his district complaints had been made regarding the interruption to the services caused by the excessive amount of coughing "which was " so great as to become a perfect nuisance." He had had instances of "colds" passing through families, but he had not regarded them as due to an infection. Whooping cough had been prevalent in some villages not many miles from Laxfield, and the amount of coughing in churches, chapels, and schools, was thought perhaps to be due to commencing pertussis in the children.

Mr. Lay, of Peasenhall, in the Blything Rural Sanitary District, informed me, on May 7th, that whooping cough had been very prevalent in Peasenhall and Sibton, situate each about four or five miles south-east from Laxfield. The ages of his cases "had been from six " months to five years, and were followed about the third week by " pneumonia with rapid failure of the heart's action." There is here a possibility suggested that a malady like that at Laxfield might have attacked children who had passed through the acute stage of whooping cough. Mr. Lay unfortunately did not give me details as to dates or numbers of fatal cases. Several of the medical gentlemen with whom

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I discussed the question told me that they had cases where they were led to believe the child was about to develop whooping cough, but that no whoop had developed; so that they, although men of experience, had to confess themselves mistaken in the diagnosis.

Dr. Connor, of Earl Soham (about eight miles south-west of Laxfield), says he has recently had "a number of ordinary cases of "bronchitis in infants and young children, but only *one case* that "would at all answer to the type of cases you describe." This one case occurred in a village 6 miles south of Laxfield, "and was "*broncho-pneumonia with an unusual amount of nervous symptoms.*"

The other medical testimony was negative up to the present date (May 19th).

CONSIDERATIONS AS TO THE NATURE OF THE LAXFIELD MALADY.

Its similarity to that which prevailed at Raunds in 1891.

Mention has been made of a somewhat similar epidemic which occurred at Raunds in the early part of 1891. By way of comparing the two outbreaks and with a view to ascertaining whether they were manifestations of one and the same disease, the leading features observed in the two outbreaks are here placed in parallel columns.

THE RAUNDS OUTBREAK.	THE LAXFIELD OUTBREAK.
Vomiting, drowsiness, fever, cough, sore-throat. Diarrhœa in about one-third of the cases. Herpes of the lips in several cases. Jaundice in some cases.	Vomiting, drowsiness, fever cough, sore-throat. Diarrhœa a common symptom. Herpes of the lips frequent. Jaundice not observed.
Symptoms consistent with meningitis, *e.g.*, delirium, fits of screaming, squinting, retraction of the head, convulsions and coma in fatal cases.	Meningeal symptoms in some, *e.g.*, delirium, fits of screaming, some retraction of the head, convulsions and coma in fatal cases.
Enlargement of parotid and cervical glands. Prevalence of sore-throat in adults of invaded household.	Enlarged cervical glands. Sore-throat among adults in invaded families in some cases.
Lung mischief varying from mild bronchitis to acute pneumonia.	Lung affection varied from bronchial catarrh to acute pneumonia.
Profuse sweating and epistaxis towards the termination of acute symptoms.	Profuse sweating and epistaxis observed in a number of cases.
Only 5 cases out of 155 attacked had a red scarlatina-like rash followed by desquamation.	Only 3 cases (all in one family) out of 66 attacked had a red patchy eruption followed by desquamation.
The disease mainly attacked young children, especially those under 10 years.	The disease mainly confined to children under 10 years.
Nine out of the total 10 deaths from the malady were in children under 2 years of age.	All the deaths, six in number, were in children under 3 years of age.
The average duration of the acute symptoms was from 10 to 12 days, but mild cases lasted only 5 days or so.	The average duration of the illness varied from about 3 days in mild cases to 14 days in more acute instances.
Ear discharges developed in several cases.	An ear discharge was observed in a few cases.
The epidemic period comprised five weeks.	The epidemic lasted four weeks.

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It will be noticed that in the main clinical features of the two outbreaks there is a close resemblance. In the Raunds outbreak there was, in certain respects, greater severity of the symptoms.

Relation of the Laxfield Malady to Meteorological Conditions.

The general impression in the locality was, at first, that the prevalence of illness among children in Laxfield and the neighbourhood was due to climatic conditions. It is true that from March 25th to April 14th, the period for which I have obtained some meteorological data, the wind was generally in the E., S.E., or N.E. But the weather was fine, dry, and warm for the season of the year; moreover the outburst of illness in April was altogether unlike one due to weather, and followed in nearly all respects the course of some acute infectious disease when it becomes epidemic in a locality. The occurrence of plurality of cases in families, too, is quite unlike ordinary illness due to chills. The following meteorological data were not taken at Laxfield, but at Somerleyton Rectory, some 19 miles distant to the N.E. No reliable and detailed observations could be obtained from any nearer point.

TABLE V., showing METEOROLOGICAL OBSERVATIONS taken at SOMERLEYTON RECTORY by the Reverend CHARLES J. STEWARD from 25th March to 14th April 1894.

Date 1894.	9 A.M.			3 P.M.			Thermometer.			
	Barometer.	Wind.		Barometer.	Wind.		Maximum Degrees Fahr.	Minimum Degrees Fahr.	4 Feet.	Rain.
		Direction.	Force.		Direction.	Force.				
March 25	30·234	E.	1	30·180	E.	1	51·5	40·2	43·6	—
„ 26	30·114	S.E.	1	30·086	S.E.	1	55·9	27·0	43·9	—
„ 27	30·132	E.	1	30·166	N.E.	1	59·0	27·0	44·0	—
„ 28	30·290	N.E.	1	30·308	N.E.	1	44·0	34·2	44·0	—
„ 29	30·250	E.	1	30·200	E.	1	54·3	38·7	44·0	—
„ 30	29·962	S.E.	1	29·952	S.E.	1	57·5	30·0	44·0	—
„ 31	29·774	S.W.	1	29·832	S.E.	1	65·0	34·0	44·1	—
April 1	30·028	S.W.	0	30·028	S.E.	1	63·7	39·4	44·3	·008
„ 2	29·990	S.E.	1	29·898	S.E.	1	56·4	37·7	44·5	—
„ 3	29·936	E.	1	29·924	N.E.	1	51·6	38·5	45·0	·010
„ 4	30·090	N.W.	0	30·132	N.E.	1	52·2	38·0	44·8	—
„ 5	30·216	N.E.	1	30·224	N.E.	1	49·8	39·9	45·0	—
„ 6	30·084	N.E.	1	30·098	N.E.	1	49·4	41·4	45·0	·004
„ 7	30·034	N.E.	1	30·024	N.E.	1	59·3	42·0	45·2	—
„ 8	29·940	S.E.	1	29·930	S.E.	1	64·0	43·0	45·4	—
„ 9	29·998	W.	1	30·096	S.E.	1	67·8	47·0	45·7	—
„ 10	30·126	N.W.	1	30·122	S.E.	1	64·3	40·0	46·0	—
„ 11	30·002	S.E.	1	29·956	N.E.	1	64·5	45·0	46·1	·060
„ 12	29·826	N.E.	1	29·792	S.E.	1	51·6	45·2	46·5	·495
„ 13	29·842	E.	1	29·342	N.E.	1	50·5	43·0	47·0	·010
„ 14	29·798	S.E.	1	29·788	S.	1	56·7	33·0	47·0	—

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It is not denied that the months of March, April, and May are often attended by east winds, which have a pernicious effect upon those liable to lung affections, and pneumonias are perhaps as likely to occur in March and April as in any other months; but in the present instance the foregoing meteorological data do not appear to afford a satisfactory explanation of the sudden outburst of illness rapidly spreading through the parish, and as suddenly subsiding. Since east winds are so constant a factor during the early months of the year in districts situated in the eastern counties, the local death records might be expected to show year by year a larger proportion of deaths from respiratory diseases in the spring than in other parts of the year. An examination of the mortality returns does not confirm this hypothesis. The facts as to occurrence of deaths from all causes and from respiratory diseases during the last four years in Laxfield may be studied in Tables VI., VII., and VIII.

TABLE VI., showing the NUMBER of DEATHS in the Parish of LAXFIELD from all CAUSES and from RESPIRATORY DISEASES, under Five Years and over Five Years of age, for each year from 1890 to 1893 inclusive.

Population of Parish, 905.		1890.	1891.	1892.	1893.	Totals.
Deaths from all causes -	Under 5 years	3	4	3	1	11
	Over 5 years -	12	11	14	7	44*
Deaths from respiratory diseases - - -	Under 5 years	1	2	—	1	4
	Over 5 years -	2	2	4	1	9

* During the four years 1890 to 1893 inclusive 31 persons died from various causes in Laxfield, having attained the age of 60 years and upwards, &c.:- -

From 60 to 70 years, 6 deaths.
From 70 to 80 years, 15 deaths.
From 80 to 90 years, 9 deaths.
90 years and upwards, 1 death.

TABLE VII., giving the NUMBER of DEATHS from all CAUSES in each month in LAXFIELD during the years 1890–91–92 and 1893.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1890	2	2	—	—	3	2	2	—	1	1	1	1	15
1891	1	2	2	1	2	2	1	—	—	1	1	2	15
1892	4*	2*	—	—	2	2	2	—	2	1	2	—	17
1893	—	1	—	1	1	1	2	—	1	—	1	—	8
1894	1	1	1	5†	2	—	—	—	—	—	—	—	—

* Influenza epidemic in January and February.
† The sixth death from the epidemic illness took place on May 2nd.

Table VIII., showing Deaths from Respiratory Diseases at two Age-periods distributed over different Months of the Year in which they occurred in Laxfield, 1890 to 1893 inclusive, and in the First Five Months in 1894.

—	—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1890 -	Under 5	—	—	—	—	1	—	—	—	—	—	—	—	1
	Over 5 -	—	—	—	—	—	—	1	—	—	—	1	—	2
1891 -	Under 5	—	1	—	—	—	—	—	—	—	—	—	1	2
	Over 5 -	—	—	—	—	2	—	—	—	—	—	—	—	2
1892 -	Under 5	—	—	—	—	—	—	—	—	—	—	—	—	—
	Over 5 -	1	1	—	—	—	1	—	—	—	1	—	—	4
1893 -	Under 5	—	—	—	1	—	—	—	—	—	—	—	—	1
	Over 5 -	—	—	—	—	—	1	—	—	—	—	—	—	1
Totals	Under 5	—	1	—	1	1	—	—	—	—	—	—	1	4
	Over 5 -	1	1	—	—	2	2	1	—	—	1	1	—	9
1894 -	Under 5	—	—	—	5	1	—	—	—	—	—	—	—	—
	Over 5 -	1	1	—	—	—	—	—	—	—	—	—	—	—

It is thus seen that for the parish of Laxfield the total deaths from all causes for the four years ending December 31st, 1893, numbered 55, and that of the 13 of these due to respiratory disease, only one occurred in the months of March and April.

But in 1894, no less than six deaths in children under five years of age occurred from respiratory diseases between April 12th and May 2nd, which suffices to demonstrate the exceptional character of the recent epidemic.

Annexed will be found a table showing the number of deaths from all causes, from respiratory diseases, and from influenza and certain other maladies in the whole Hoxne Rural Sanitary District in each year from 1887 to 1893 inclusive, and for the first five months of 1894. It affords comparison of the number of deaths due to respiratory diseases and the number due to other prevalent diseases, such as influenza, whooping cough, and measles.

Possible identity of the Laxfield Malady with Influenza.

Later on, when the cases of illness in Laxfield showed a tendency to spread through families, the ailment came to be regarded by some local people as a manifestation of epidemic influenza. This disease is stated to have been generally prevalent in the locality during the early part of 1890 and up to April of that year. During 1891 there were a few cases of the kind in the parish, but in 1892 there was a somewhat severe prevalence of epidemic influenza in Laxfield and the adjoining villages. Although cases of influenza cropped up in the Hoxne Rural Sanitary District during 1893, no recurrence of the disease was noted in Laxfield; but Dr. Biden says that in the early part of 1894 he attended "4 elderly ladies with bronchitis without expectoration; "with marked deafness and no external ear signs," which cases he looked upon as being "influenza." These cases are said to have "suffered from marked depression at the end of the second week."

Inquiry as to occurrence of influenza in children in the previous epidemics showed that children had suffered along with adults, though none of their cases had proved fatal; and subsequent investigation showed that a number of the children attacked by the Laxfield illness in 1894 had suffered from well-marked influenza during the epidemic of 1892. On being questioned, mothers, at Laxfield, stated generally that the 1894 illness was not, in their opinion, the same disease as had attacked them and their children in 1892. There cannot, however, be any dispute but that there is resemblance between the symptoms of the 1894 outbreak at Laxfield and those of some recent epidemics of influenza. The onset, course, and duration of the illness are somewhat similar in both diseases. The question arises, if the diseases mentioned are one and the same, Why on this occasion had it vented its severity almost entirely upon children under 10 years of age? If it be argued that the adults in Laxfield have acquired some degree of immunity from the infection through one or more previous attacks, and that therefore the disease readily attacked the more susceptible individuals, viz., the younger children, the answer is that numerous children who suffered from epidemic influenza in 1892 had the Laxfield malady of the present year with unmitigated severity; and further, that adults in recently invaded households who suffered from concurrent illness did not show the more usual manifestations of epidemic influenza. A point which struck other observers about Laxfield and elsewhere was the nature of the cough. More than one medical man, as has been said, expected to see his patients develop whooping cough, but no such disease followed, though the patient had not previously had pertussis. The cough in many cases appeared to be of a spasmodic kind, and this character of the cough has also been observed in epidemic influenza.

Another suggestion has been made by Mr. Jeafferson, of Framlingham, a gentleman of great experience, and with a wide knowledge of the locality, that this disease was what he terms "herpetic fever," an acute disease due, he believes, to a specific poison, and of which he tells me he has seen, since 1882, groups of cases from time to time. This disease, according to Mr. Jeafferson, may show much variation in type, being sometimes prevalent as acute pneumonia, at other times merely as acute bronchial catarrh, and in his experience there are sometimes relapses with a second or even further crops of herpes. But herpes is not noticed in all cases, though it is a frequent symptom. It may, he says, be found upon the tonsils or upon the inner surface of the lips in certain instances. Mr. Jeafferson further informs me that Dr. W. Squire has written upon this subject, and that in 1874 this gentleman called attention to a disease resembling "herpetic fever," but which he regarded as "influenza," in which the epidemic cases have "a short "incubation, a sudden elevation of temperature, often subsiding on the "third day." In 1875, Dr. Squire wrote further on the subject, calling attention to the disease, which he stated sometimes co-existed with diarrhœa and sometimes with a roseola-like erythema, of short duration. In a paper published in the "Lancet" of August 16th, 1890, p. 340 ("On Herpes with Tonsilitis, mistaken for Specific Fevers"), Dr. Collie gives a series of cases occurring in October, November, and December 1889, where many of the symptoms, such as the initial vomiting, are suggestive of something resembling the Laxfield cases.

Possible relation of the Laxfield Malady to Rötheln.

It will have been observed that the malady under consideration presented certain clinical features, such as sore-throat, enlargement of cervical glands, and, occasionally, injection of the conjunctivæ, which might be regarded as suggestive of rötheln; and that in particular cases the resemblance to that disease—even to the rash followed by fine desquamation, or to enlargement of the chain of glands posterior to the sterno-mastoid—was decidedly striking. But the fatality, the relative severity of the non-fatal cases, the frequent occurrence of lung complication, of diarrhœa, and the cerebral disturbance, furnish a marked contrast to the characters ascribed to rötheln by modern authorities. In this connexion, however, it should not be forgotten that, as regards fatality and general severity, the descriptions of rötheln given by some of the earlier writers differ conspicuously from those of the writers of to-day; and that mention is made in different accounts of the malady of symptoms which were met with at Laxfield, such as convulsions, drowsiness, vomiting, diarrhœa, stomatitis, epistaxis, profuse sweating, and swelling of the wrist joints. The apparent absence of rash in some 95 per cent. of the Laxfield cases, would, however, no doubt be generally regarded as excluding rötheln, and it would further seem probable, from the figures given in Table I., that the period of incubation in the Laxfield cases was shorter than it is usually held to be in the case of rötheln.

Possible relation of the Laxfield Malady to Cerebro-spinal Fever.

Another point of great interest is the possible connexion of this "pneumonia" epidemic at Laxfield with cerebro-spinal fever. The cases of the disease at Raunds in 1891 had in certain instances definite meningeal symptoms, and this was more strongly marked in a concurrent outbreak at Heyford, also in Northamptonshire, and reported upon at the same time. The same association of pneumonia and cerebro-spinal meningitis symptoms were heard of in the early part of 1891 in other parts of Northamptonshire, as, for example, in the Kettering district.

In 1890 I investigated several localised occurrences of cerebro-spinal fever in certain parishes in the eastern counties, and among them I collected notes of 12 marked cases of this disease at Oakley, 9 miles, as the crow flies, from Laxfield; 2 cases at Brome, about the same distance away; 4 at Scole, and 1 at Bressingham; these places being respectively 10 and 15 miles from Laxfield; and, lastly, 1 case at Kenton, 8 miles off. These localities are situated to the west, north-west, and south-west of Laxfield. Since these inquiries, I have heard of two (or more) cases of cerebro-spinal fever, one of them fatal, at Saxtead, in 1890. Saxtead is in the Hoxne Rural Sanitary District, and is situated only 6 miles due south of Laxfield. I also heard of two other cases in December 1890 as having occurred 6 miles north of Woodbridge, and about 13 miles from Laxfield.

The association of cerebro-spinal meningitis and pneumonia has often been remarked. In a recent work on pneumonia, the following passage occurs: "So marked is this connexion (of pneumonia to cerebro-spinal "meningitis, whether epidemic or sporadic) that it may be questioned "whether every case of meningitis complicating pneumonia should "not be considered as falling under the head of infective disease." (Sturges and Coupland, 2nd edition, p. 120.) It is true that the meningeal symptoms were less marked in the Laxfield cases than in the Northamptonshire cases of 1891, but the most characteristic feature of cerebro-spinal meningitis, viz., the retraction of the head, was observed by Dr. Biden in several of his cases, and by another medical man in one case.

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A death in an adult was certified from "pneumonia and meningitis" at Hoxne, on January 1st, 1891. In the same village, on March 31st following, a child, aged one year, died from "meningitis." On March 4th, 1892, a young woman, aged 23, died from "meningitis" at Metfield, in the Hoxne Rural Sanitary District.

It is also worth notice that herpes was frequently observed in the Laxfield cases. The form of eruption which, of all others, is frequent in epidemic cerebro-spinal meningitis is the herpetic.

In summing up the evidence as to the nature of the malady recently prevalent at Laxfield, it is not to be denied that, in many particulars, the epidemic resembled some of the more recently observed outbreaks of influenza. The manifestations of this disease during the last four years appear to have taken several different forms; and unless observers have fallen into the error of confounding influenza with some other malady or maladies, the disease would seem to undergo considerable changes in type. The fact that the Laxfield outbreak was almost altogether limited to children is in itself peculiar—pointing rather in the direction of epidemic cerebro-spinal meningitis* than of influenza. The suggestion, however, arises, and this has already been discussed by some writers, as to whether, after all, epidemic influenza may not be a manifestation, modification, or, so to speak, a "sport" of cerebro-spinal fever.

During the last four years the medical periodicals have furnished cases in which serious nervous symptoms have accompanied influenza, or followed it, *e.g.*, "tetaniform convulsions," "myelitis," &c. There have also occurred of late years, associated with influenza epidemics, groups of cases having meningeal symptoms, and in instances where death has not followed, there has been left behind permanent nervous mutilation. Such an example occurred in North Lincolnshire, in the Market Rasen district, and was reported to the Board by the Medical Officer of Health, Dr. Barton, in the summer of 1891, when some 15 or more persons, mostly children, had paralysis of one sort or another following attacks of illness during an influenza outbreak. Along with the frequently appearing influenza outbreaks, we are also hearing oftener nowadays of outbreaks of so-called cerebro-spinal meningitis, which at one time was regarded as a rare disease, at least in its epidemic form, in this country. One interesting outbreak of this kind occurred in a Shropshire village in May 1891. Out of a population of 250 there were 43 cases, wholly confined to children between the ages of 1 and 12 years; only two cases were fatal. Previous to this outbreak there was a diarrhœa epidemic, and immediately following it was a wide prevalence of influenza. Dr. Thursfield informs me that many of the sufferers had a herpetic eruption about the mouth. The patients had pains in the head, a discharge from the nostrils and from the eyes. In the severer cases there was congestion of the lungs. The onset of the disease was sudden. There was vomiting, vertigo, headache, and great prostration. There was drowsiness, and, in infants, fits of screaming.

This description is not unlike that of the Laxfield cases; but in the Shropshire cases there was constipation. Well-marked retraction of the head in some and stiffness of the neck in others were also observed.

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* In the great epidemic on the Lower Vistula of 1865, out of a total of 347 deaths at all ages, the deaths under 14 years of age numbered 318.—Annual Report of the Medical Officer to the Privy Council, 1865, p. 270.

With regard to the Laxfield cases, and the apparent absence of meningeal symptoms, it may be remarked that authorities are agreed that the diagnosis of cerebro-spinal meningitis in children is difficult, and liable to be overlooked; indeed, one writer* says, "My observations "lead me to think that the younger the child the more frequently "is cerebro-spinal meningitis overlooked, and some other disease "diagnosed."

Without doubt, children are more susceptible to this disease than others, and the fact that the Laxfield disease spent itself almost entirely upon young children is evidence in that direction. Unfortunately, permission to make a post-mortem examination in any of the fatal cases could not be obtained, and therefore we have not the assistance which this would have supplied.

The sudden rise and fall of the epidemic is, it must be admitted, very similar to what has been so often recognised in influenza outbreaks.

In the absence of pathological and bacteriological examination of internal organs and their secretions, it is impossible to arrive at a definite conclusion as to the real nature of this Laxfield outbreak.

The infection was very possibly imported into the parish. "Travellers," or nomadic hawkers often pass near Laxfield. Dr. Smart remembers, he says, having a child brought to him by a gipsy woman, suffering from what appeared to be broncho-pneumonia, in March; but as he only saw the child once, in his surgery at Fressingfield, and as the people moved on the same day, he is unable to give me any further details. The Easter holidays (Easter Sunday was on March 25th) just preceded the outbreak, and if influenza infection was in question, visitors to Laxfield from a distance, or village holiday-makers returning from visits to places far removed, might very easily have brought the infection. Be this as it may, when this illness was introduced, it spread by contact of the sick with the healthy. Though the public elementary schools were closed, there yet remained the assembling of children at Sunday school, church, and chapel. In this way infection was probably brought in the first instance to the household by those old enough to attend Sunday school, and it was not till infants developed the severer symptoms that attention was directed to the malady. After April 2nd, no doubt some of those who were a little out of sorts, having the illness mildly, returned to school, and in all probability the infection was given and received there from one scholar to another in the day schools.

Though the water-supply and drainage of Laxfield are not altogether satisfactory, no suspicion attaches to them as factors in the outbreak. The children of Suffolk labourers are fed much on bread, and with very little animal food; no evidence, however, was found suggesting any article of food as the cause of this illness; besides, the better fed children of farmers and tradesmen suffered equally with those brought up on more meagre fare in cottages.

On the whole, though no definite conclusion can yet be arrived at, the evidence is not incompatible with the view that the prevalent malady might have been a form of epidemic influenza. But the type of the disease, attacking chiefly young children, was different in several respects from that which we have been in the habit of regarding as characteristic of that disease, and there is a strong suspicion of a "nervous" element throughout the cases. It is worthy of remark that, at Laxfield, not only were there fatal cases, but the character of the symptoms was distinctly more severe in the non-fatal cases than was observed by other medical men at Occold, Bacton, Framlingham, and elsewhere.

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* Dr. Lewis Smith (of New York), Cyclopædia of Children's Diseases.

TABLE showing NUMBER of DEATHS certified from all Causes, from Respiratory Diseases, from Influenza, Whooping Cough, and Measles, in the Hoxne Rural Sanitary District, from 1887 to 1893 inclusive, and also during the First Five Months of 1894.

Hoxne R.S.D. Population (in 1891), 11,461.		1887.	1888.	1889.	1890.	1891.	1892.	1893.	First 5 Months, 1894.	—
Deaths from all causes		190	191	186	216	200	198	190	101	
Deaths from respiratory diseases.	Under 5	9	9	1	12	14	14	14	15	
	Over 5 -	14	10	9	22	20	31	20	4	
Total all ages -		23	19	10	34	34	45	34	19	
Deaths from influenza at all ages - -		—	—	—	1	—	3*	2†	5‡	All the deaths directly or indirectly certified from influenza were in adults; most of them of advanced years.
Deaths from whooping cough - -		1	—	14	—	—	—	2	5	
Deaths from measles -		5	—	—	—	1	3	—	—	

* These three deaths do not include all the mortality connected with influenza, for, as regards no fewer than 10 other deaths, "influenza" appeared on the certificate as a secondary cause.

† In a third case influenza was entered as a secondary disease, heart disease being given as the primary cause.

‡ These five deaths, all in adults, occurred at Denham (2), Monk Soham (2), and Horham (1), respectively 6¼, 7, and 5 miles from Laxfield, and were in each instance associated with pneumonia, acute bronchitis, or some such respiratory disease, as the secondary cause of death.

No. 8.

REPORT on a Prevalence of SMALL-POX in and around the BOROUGH of HASTINGS; by Dr. R. BRUCE LOW.

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On Small-pox in and around Hastings; by Dr. Bruce Low.

In 1884, 1885, and 1886 there was a considerable prevalence of small-pox in the Hastings Registration District. In 1884 in the Borough of Hastings 12 cases came under notice, 2 of them proving fatal. In 1885 no fewer than 50 cases were heard of, and 6 of these died. In 1886 only 9 cases were reported, 1 of which was fatal. In the Rural Sanitary District 2 deaths from small-pox occurred in 1884, 15 in 1885, and 1 in 1886, making a total number of deaths from small-pox in the Registration District of Hastings of 4 in 1884, 21 in 1885, and 3 in 1886. After this not a single case came under the notice of either of the Sanitary Authorities concerned till 1893, when the disease was imported by strangers on five distinct occasions into the Hastings Urban District. The outbreak of 1893 comprised 11 cases, 1 proving fatal.* These cases were treated in an extemporised hospital camp upon an isolated farm belonging to the Corporation of Hastings, and situated in the parish of Ore, in the Rural Sanitary District. This hospital camp was broken up early in October 1893, and from that date no further cases of small-pox were heard of, in or about Hastings, till the 5th of January 1894, when the disease was notified in the person of J. J., a stranger (Case 1) who had come to Hastings on December 31st from Oldham, travelling through London, where he had stayed a few days *en route*. This patient, a male, aged 38, was removed on January 6th to the iron pavilion in the grounds of the Borough sanatorium. He died there on January 11th. His body was then removed to the laundry close by the pavilion, where it remained till January 13th, when it was conveyed in a hearse to the mortuary at the town cemetery in the parish of Ore. The funeral took place on January 15th. During his illness in hospital the patient was waited upon by two men, one of whom, M., had small-pox in 1893. The other, K., aged 42, was a male attendant at the sanatorium. He was re-vaccinated on January 6th, but the operation proving unsuccessful, it was repeated on January 9th, this time with success. On January 13th, M., after his clothing had been disinfected by steam at the town depôt, and after, among other precautions, he had had a bath, went back to Hastings, meeting there, the same evening, two friends. These men, with their wives, joined M. in partaking of some refreshments at a public-house, where the party remained together for some time. Two of this party, one a male and the other a female (Cases 2 and 3), were attacked by small-pox about January 26th; they were removed to the iron hospital. Meanwhile the other attendant, K., had remained after M.'s departure to disinfect and clean the ward where the first patient died. K. (Case 4) was to have left the iron pavilion on January 20th, but on the 19th he felt unwell, and he developed, he says, three spots, two of which were on his face and one on his unvaccinated arm. He prudently remained in the hospital. On January 26th a young man (Case 5) who had driven the body of J. J., the fatal case, on January 13th in the hearse from the iron hospital to the cemetery, was brought to the hospital suffering from small-pox. Meanwhile in the main building of the Borough sanatorium, within 100 yards of the iron hospital, three persons, all adults, under treatment for, and recovering from, scarlatina, were found on January 23rd to have developed small-pox. They were removed therefore to the iron pavillion. These cases were, a young woman aged 28 (Case 6), a young woman aged 23

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* A tramp from London, with no vaccination marks.

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(Case 7), and a male patient aged 41 (Case 8). On the removal of the first female case to the iron pavilion, K.'s wife, aged 39, was employed as nurse. She was successfully re-vaccinated on the day she entered upon her duties. She tells me that "about a fortnight" afterwards she had two or three spots, but she was able to continue her work, not feeling any disturbance of her system. This case is doubtfully one of small-pox. I have regarded it, however, as a suspicious case and numbered it as No. 9. In the course of my investigations I heard of a case (No. 10) in the person of a young girl aged 19 years, a resident at Ore, who had been for some weeks, ending 12th January, an inmate of the workhouse, which is only about 250 yards from the iron pavilion. She was discharged on January 12th from that institution, and slept at her mother's house, which is within 200 yards of the hospital, that same night. She returned to the workhouse on the morning of January 13th for a short time to have an interview with the matron, and left Ore in the afternoon by rail for Tunbridge Wells, where she had obtained a situation. She would have to pass by the boundary fence of the hospital in going to and from her home to the workhouse. She developed small-pox at Tunbridge Wells on or about January 25th, and was removed to the isolation hospital there. She was unvaccinated, but recovered. She infected three persons (her mistress and mistress' two sons) at Tunbridge Wells. On February 7th two cases were notified (Cases 11 and 12), and on the 8th two more (Cases 13 and 14); all four were members of one and the same family, residing in a house at Ore, within 300 yards of the iron hospital. In the Borough three cases, children of Case 3, were notified respectively on February 9th, 16th, and 17th (Cases 15, 16, and 17). On February 13th three cases were reported from the workhouse at Ore (Nos. 18, 19, and 20), and on the same day, another case (No. 21) from a house 600 yards distant from the iron pavilion. On February 14th a case was notified at the workhouse (No. 22) and on the 15th yet another (No. 23) from the same place. On February 16th, 17th, and 18th single cases were reported in three houses in Ore (Nos. 24, 25, and 26). From this time onward to March 22nd, 18 more cases of small-pox were notified in Ore; six of these came from the workhouse, making (not including the girl who went to Tunbridge Wells) 11 cases notified from this institution. In the Borough other cases were also being notified, but these were all, or nearly all, traceable to relation with previous cases. At first some Borough cases could not be traced to their sources, but Dr. Wilson, the Borough Medical Officer of Health, made careful personal inquiry into each case, and his perseverance was rewarded in nearly every instance by tracing a connexion with antecedent small-pox. His detailed inquiries brought to light several examples of unnotified cases, which had either had no medical attendance or had been regarded as chicken-pox or some other disease, the extreme mildness of the malady in vaccinated young persons causing considerable difficulty in diagnosis even to experienced practitioners. To this point I shall refer again. Altogether, up to March 22nd, there had occurred some 54 cases, 17 of them from the Borough, and 37 from Ore in the Rural Sanitary District. Early in March the Sanitary Committee and their adviser, Dr. Wilson, came to suspect that the iron pavilion was acting as a diffuser of small-pox infection to those living in the locality. Acting on this view a hospital camp was rapidly prepared about a mile or more from Ore, on a somewhat secluded site, at Ore Villa Farm, the tenant of which was compensated for immediate evacuation of his house and land. Two large hospital marquees were erected here, viz., one 60 feet × 30½ feet for female patients, and another 40 feet × 20 feet for males. These tents had double canvas walls and were supplied with boarded floors, and were warmed by hot water pipes; means for

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ventilation were also provided. The farmhouse was used as an administrative building. A resident medical officer, Dr. Hutley, was engaged from London; two male and two female nurses and a cook were also employed. On March 5th (up to which date 29 cases had been admitted there for treatment) the removal of the small-pox patients from the iron pavilion to the camp was commenced, and completed on March 8th. During the outbreak, which lasted from January to June, there occurred no fewer than 86 cases of small-pox, of which nine proved fatal. The following Table I. shows the course of the epidemic during each fortnight from its commencement, and distinguishes the number occurring in the Borough and in the Rural Sanitary District.

TABLE I.—Showing the NUMBER of CASES of SMALL-POX which occurred in the HASTINGS URBAN and RURAL DISTRICTS during each Fortnight from January to June 1894 inclusive.

1894.	Number of Small-pox Cases reported in the Hastings *Urban District.*	Number of Small-pox Cases reported in the Hastings *Rural District.*	Total Small-pox Cases in the Hastings Registration District.
Fortnight ending January 6th -	1	—	1
„ „ „ 20th -	—	—	—
„ „ February 3rd -	3	5	8
„ „ „ 17th -	3	14	17
„ „ March 3rd -	1	7	8
„ „ „ 17th -	7	6	13
„ „ „ 31st -	5	8	13
„ „ April 14th -	6	7	13
„ „ „ 28th -	7	—	7
„ „ May 12th -	3	—	3
„ „ „ 26th -	—	1	1
„ „ June 9th -	—	—	—
„ „ „ 23rd -	1	1	2
	37	49*	86

* All the rural cases except one, which is mentioned at the end of the report, occurred in the village of Ore. I have classed the case of the girl who went to Tunbridge Wells as an Ore case, since she got her illness in the village.

The next Table II. shows the age and sex of each person attacked, and the age and sex also of the fatal cases.

TABLE II.—Showing the AGE and SEX of each of the 86 CASES of SMALL-POX, and of the 9 DEATHS therefrom, in the HASTINGS REGISTRATION DISTRICT during the First Half of 1894.

—	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
Under one year -	2	1	3	2	—	2
1 to 5 years -	3	2	5	—	1	1
5 to 10 „ -	3	3	6	1	—	1
10 to 15 „ -	3	8	11	—	—	—
15 to 25 „ -	12	15	27	—	1	1
25 to 40 „ -	6	13	19	1	1	2
40 to 60 „ -	6	6	12	2	—	2
60 and upwards -	—	3	3	—	—	—
	35	51	86	6	3	9

VACCINATION.

In regard to these 86 cases inquiry was made as to whether they had or had not been vaccinated. In seven out of the 86 it was not found possible to obtain definite information. Two of the seven were fatal cases, in which the patients, when first seen at a late stage of the disease, were so covered by the confluent eruption and so ill that neither by examination of their arms nor by questioning could any definite information be obtained; and in both instances no relatives were found to give that which was needed. As to the other five non-fatal doubtfully vaccinated cases, there were no visible marks or scars on their arms, nor were the patients themselves or their friends able to give definite answers on the question of vaccination or non-vaccination. In the subjoined Table III. I have arranged the 86 cases in three classes with regard to their vaccination.

TABLE III.—Showing the NUMBER in each instance of VACCINATED, UNVACCINATED, and "DOUBTFUL" among 86 SMALL-POX PATIENTS in the HASTINGS REGISTRATION DISTRICT during the First Half of 1894.

—	Cases.	Deaths.	Per-centage of Deaths to Attacks.
Vaccinated - - -	67	3	= 4·4 per cent.
Unvaccinated - - -	12	4	= 33·3 "
Doubtful - - -	7	2	= 28·5 "
	86	9	= 10·4 per cent.

In the next Table IV. the ages of the cases in each class are shown.

TABLE IV.—Showing the AGES respectively of the VACCINATED, UNVACCINATED, and "DOUBTFUL" CASES, comprised in Table III. above, who had SMALL-POX in the HASTINGS REGISTATION DISTRICT during First Half of 1894.

—	Under One Year.	1 to 5.	5 to 10.	10 to 15.	15 to 25.	25 to 40.	40 to 60.	60 and upwards.	Total at all Ages.
Vaccinated -	1*	3	—	10	24	15	11	3	67
Unvaccinated -	2	2	6	—	2	—	—	—	12
Doubtful -	—	—	—	1	1	4	—	1	7
	3	5	6	11	27	19	11	4	86

* This infant's mother was attacked by small-pox three weeks after her confinement. She was removed to the Camp Hospital, and her baby was at once vaccinated by Dr. Sanderson and sent with her to hospital. On the 12th day after admission the infant developed "eight spots," but suffered little or no constitutional disturbance, and made a rapid recovery, with no trace or mark of its illness. The mother, on the other hand, who had no visible vaccination scars, and who did not know whether or not she had ever been vaccinated, had a severe confluent attack.

Three vaccinated children between the ages of 1 and 5 years suffered attack. The facts respecting them are as follows:—(1.) A child aged 3, with three vaccination scars, had only "six spots." (2.) A child aged 2, with two vaccination scars, had only "one spot," there being three other small-pox cases at the time in the family. (3.) A child aged 4, with three vaccination scars, had only "a few spots;" his father, his mother, and a sister having small-pox at the same time. In all three of the above children the illness was of a trivial kind.

The facts as to the nine fatal cases are as follows:—

(1.) J. J., aged 38, from Oldham. Vaccination doubtful; no information obtainable. Died from hemorrhagic small-pox on January 11th, in the iron pavilion.

(2.) J. B., aged 41, a convalescent from scarlet fever in the sanatorium. Vaccinated in infancy, three scars. Died on February 2nd, in the pavilion, from hemorrhagic small-pox.

(2.) A. G., aged 29. A workhouse inmate, confined there of her third illegitimate child on February 10; small-pox appeared in her on February 13th, and she died on February 20th in the iron pavilion. No vaccination marks visible, and no information obtainable from friends.

(4.) C. A., aged 3 weeks. Unvaccinated. Died of small-pox at Ore on February 16th.

(5.) The infant (unvaccinated) child, aged 13 days, of A. G. Died of small-pox on February 23rd, in the iron pavilion. An attempt was made to vaccinate this infant when the mother was taken ill, but the operation did not take.

(6.) E. S., aged 21. Vaccinated in infancy, three indistinct scars. Was taken ill on March 30th, and died from hemorrhagic small-pox on April 8th. Her brother and her mother had the disease before her. She suffered from the hemorrhagic diathesis. An attempt was made to re-vaccinate her when the other members of her family were attacked by small-pox, but the superficial scratches bled profusely, and the operation was unsuccessful; the medical man stated that he dared not risk another attempt owing to her hemophilic condition.

(7.) C. S., aged 2½. Unvaccinated. Died of small-pox on April 3rd. The parents stated that this child had not been vaccinated owing to frequent changes of address. They were not opposed to vaccination.

(8.) A. B., aged 7. Unvaccinated. Certified to have died of "malignant measles" on March 28th. There were hemorrhages from eyes, gums, &c., and the medical attendant admits that the diagnosis of "measles" is open to question. Moreover, a series of other undoubted small-pox cases were traced to relation with this case, leaving no doubt in my own mind, nor in the mind of the Medical Officer of Health, Dr. Wilson, as to the real nature of the malady.

(9.) J. C., aged 59. Vaccinated in infancy, three marks. Died in the camp hospital on May 10th; his wife and two of his family had suffered from mild attacks before he was taken ill.

Thus, of the 9 deaths, 4 were in unvaccinated subjects; in 2 the facts as to vaccination could not be ascertained; and in 3 instances, all adults, the patients had not been vaccinated since infancy. The fatality of the

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disease in reference to vaccination and non-vaccination, at ages under 10 years and in older persons, is summarised below :—

—	Ages.	Total Cases reported.	Deaths.	Deaths per Cent. of Attacks.
1. Vaccinated - -	Under 10 years -	4	0	= 0·0
	Over „ -	63	3	= 4·7
2. Unvaccinated - -	Under „ -	10	4	= 40·0
	Over „	2	0	= 0·0
3. Vaccination doubtful	Under „ -	0	0	= —
	Over „ -	7	2	= 28·5
All three classes -	Under „ -	14	4	= 28·5
	Over „ -	72	5	= 6·9

The degree of severity of the small-pox attack in each case was also studied. For this purpose attacks were divided into four classes, viz., very mild, mild, severe, and very severe. In this connexion I am much indebted to Dr. Hutley for making systematic records for me as to vaccination and nature of the small-pox attack in each case. The result of this classification is seen in Table V.

Table V.—Showing the Degree of Severity of Small-pox Attack in each of the 86 Cases, distributed in the Three Classes, Vaccinated, Unvaccinated, and "Doubtful."

—	Vaccinated.	Unvaccinated.	Doubtful.	Total.
Very mild - -	35	1	1	37
Mild - - -	21	2	—	23
Severe - - -	8	5	4	17
Very severe - -	3	4	2	9
	67	12	7	86

Of the 67 vaccinated cases included in Table V. some five or so are reported to have been re-vaccinated prior to their attack. Mention has already been made in this connexion of K. and of his wife who acted as nurses in the iron hospital. Owing to the failure of the first attempt to re-vaccinate him the small-pox infection got a start in K.'s case, but his re-vaccination ran its course on the second attempt, and apparently robbed the small-pox of all severity. His wife, too, if her spots indeed were due to small-pox, passed through the mildest of attacks, and was able to continue her duties as nurse. In addition, one patient asserted that she was re-vaccinated 10 years before attack, but inquiry as to this showed that though she had submitted to the operation at that time, it entirely failed to "take." Two other adult patients, both nearly 40 years of age, were found by Dr. Hutley at the hospital camp to have two sets of scars, seemingly of different ages, and Dr. Hutley regarded one set of these scars in each instance as "evidence of previous re-vaccination." In neither case, however, could the patient recollect having been re-vaccinated. Both of these patients passed through mild attacks. Several persons were re-vaccinated while in the incubating stage of small-pox, and only a few days before the invasion of the acute symptoms. In some of these cases re-vaccination "took," in others it did not take;

where the re-vaccination took, it deserves note that the small-pox illness that followed was of a mild description.

No extension of the disease to those engaged in tending or nursing the sick took place, except in the two cases (K. and his wife) already mentioned All those engaged on the staff at the hospital camp had either been re-vaccinated or had had small-pox. In only one instance out of the 86 small-pox cases had the patient had a previous attack of that disease, viz., E. M., aged 35, who was vaccinated as an infant, and had a mild attack of small-pox when aged seven. His present attack was an unmistakable one, but though he had many spots, his other symptoms were mild, and he made a good recovery. He is evidently one of those persons having unusual susceptibility to small-pox, and in whom immunity was conferred neither by vaccination nor by previous small-pox.

Occurrence of Mild and Irregular Cases of Small-pox tending to Spread of the Disease.

It may be stated that in two cases* which were notified as small-pox, and sent as such to the hospital camp, the diagnosis was there regarded as mistaken. These cases were at once successfully re-vaccinated, and placed in a separate room in the farmhouse at Ore till the incubation period of small-pox had passed. Neither of them took the disease. There is reason to believe, however, that certain very mild cases were, as has been already mentioned, not diagnosed as small-pox at all, and were consequently never notified. These only came to light when subsequent severe and undoubted cases of small-pox had appeared in the same families. Inquiry then elicited a history of a previous "bilious attack," or an "influenza attack," in some member of the family, attended with head-ache, back-ache, vomiting, and a spot or two here and there; the person resuming work soon, or never being off work at all. Some nine unnotified cases came under notice in this way some time after their illness had passed away. They are included in the 86 cases mentioned in the foregoing tables.

At least one of these nine cases was intentionally concealed, but most of the others had had no medical advice, and were no doubt ignorant of the real nature of their illness. The following is in illustration of the spread of the disease through unrecognised cases. For much valuable information as to these particular cases, as well as to others, I am indebted to Dr. Wilson. A girl, aged 17, was taken ill on March 11th with head-ache, nausea, and general malaise. There is no history of any spots having been observed on her. The girl had four vaccination scars. She recovered in a day or two, and without medical advice. Her sister, aged 19, was taken ill on March 23rd with head-ache, back-ache, and general feeling of illness. Her eyes were heavy and injected. So far as can be learned she had only one spot on her face and two others at the roots of her hair. She had no medical attendance. There were two vaccination marks on her arm. The father of these two girls was attacked by confluent small-pox on April 2nd. These two young women were employed at a millinery establishment in Hastings; and in the room where they worked there were 18 girls and women. The head milliner was attacked by small-pox on March 30th, and she appears to have given the disease to her mother, who was taken ill with the same malady on April 12th. Another girl who worked in the same workroom developed small-pox on March 30th, and in this instance, too, the disease was conveyed by the daughter to her mother at home. Minute inquiry made by Dr. Wilson failed to find the mode in which the first girl contracted the disease. But among the 18 workers employed in this work-room several came daily from Ore, where small-pox by this time had become prevalent; and though much time was spent by the Borough Medical Officer of Health, and by the Rural Medical Officer of Health as well, trying to trace any undiscovered case of small-pox among these persons, the results were negative. Here is another illustration. A young lady, aged 22, vaccinated, two scars, was taken unwell on May 4th. She was seen by two medical men, who regarded her attack as one of chicken-pox. Her temperament was 102 degrees, and she had some "blistery spots" on the chest and subsequently on the face and forehead, but none on the arms or wrists. Dr. Wilson was asked to see the case, as there was some doubt as to its nature in the mind of the family doctor; and though it was regarded as one of suspicion, the mother of the patient positively refused to entertain the idea of removal. The patient was therefore isolated at the top of the house; re-vaccination was performed on all those who had been in contract with her, and all her washing was, after disinfection, done at home. On her recovery the usual precautions were taken, including lime-washing, re-papering, &c., of the rooms; and as no further cases had happened it was considered that either the disease had not been small-pox or that the precautions taken had been sufficient to stop its spread. However, a young man was taken ill with small-pox at Ore on May 20th. He was employed as a window cleaner at Hastings, and it transpired that on May 7th he had cleaned the windows of the house where the doubtful case of "chicken-pox" just described lived, *i.e.*, before she was isolated and before any precautions had been taken with regard to her case. The window cleaner's wife contracted the disease from her husband, and she too was removed to the small-pox camp a fortnight later. The above examples go to prove the difficulty of diagnosing much-modified cases of small-pox and the danger that is liable to arise in consequence of such cases being unrecognised. In young vaccinated persons small-pox is usually a mild disease; in many it is a very mild malady indeed, and some appear to be ill only a day or two. I heard of a case of a young professional man who had a "bilious attack," with a temperature of 102 degrees, which confined him to bed for two days only, after which, feeling quite well, he resumed his daily work. He was seen by several medical men, as he had a few spots on his face. He had three vaccination scars on his arm. No one appears to have regarded his case as one of small-pox at the time. His laundress was brought to the small-pox camp some three weeks after the gentleman had been ill, the disease having been, it is believed, conveyed to her by the linen which he had sent to the wash. It was also discovered that the professional gentleman referred to had come in relation with one of the previous doubtful small-pox cases, from whom it is likely he received infection.

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* Not included in the 86 already mentioned.

Influence of the Iron Small-pox Hospital in the Spread of the Disease.

While the careful inquiries made by Dr. Wilson in the Urban District enabled him to connect nearly every case with a previous one, it was altogether different in the Rural District, *i.e.*, at Ore, to which parish the small-pox cases occurring in the Rural District were limited. Dr. Sanderson, the Rural Medical Officer of Heatlh, resides at Ore, and he made diligent inquiry as regards the previous circumstances of every notified small-pox case in his district. In the early part of the epidemic

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he failed to connect the majority of his cases with any previous small-pox. As has been mentioned, this fact and others that came under the cognizance of the Urban Sanitary Committee, cast upon the iron hospital a grave suspicion that it had been diffusing small-pox to those living in its vicinity. Among the various circumstances which attracted attention was the attack by small-pox of the three scarlatina convalescents in the Borough sanatorium, the attack of 11 of the workhouse inmates, and of a number of persons residing in houses of the Rural District within a short distance of the hospital. Inquiry showed that beyond a radius of half a mile of the iron pavilion only three cases of small-pox occurred in the Ore up to the middle of March, and in each of these three cases the patient was known to come habitually to work in the vicinity of the hospital. Up to the removal (March 5th to 8th) of the small-pox cases from the iron hospital to the camp at Ore Villa Farm, and during the fortnight afterwards, which additional period would allow for the development of any cases contracted prior to the 8th of March (the last day when patients were in the iron pavilion), there occurred within the half-mile radius of the iron hospital no fewer than 40 notified small-pox cases. From the beginning of January to the early part of March there had been treated in this iron pavilion 29 small-pox patients.

From Dr. Hutley, under date of July 3rd, I hear that from one of the later cases treated at the camp he received information of a young man residing at Ore who early in March or at the end of February had had some spots similar in all respects to his own. The young man in question had had no medical advice, and had gone about among his friends as usual. His sister and a person staying in the sister's house took small-pox after this, and the young man is known to have previously paid several visits to the house of his sister. He lived with his mother, but she is not known to have had any similar illness, but a women at whose house she visited was brought to the camp with small-pox. From what the patient told Dr. Hutley, the latter believes that this unnotified and untreated ambulant case may have infected more persons than the three just mentioned, and that in this way some later attacks in Ore, the origin of which seemed doubtful, may be accounted for.

In regard to the 40 notified cases just mentioned, I have, on drawing a series of circles each of 100 yards round the iron hospital as a centre, ascertained the number of cases within each such area up to March 22nd. There were :—

In the 100 yards circle -	5	cases	(including the attacks in the two K.'s, and the three sanatorium cases).
„ 100 to 200 yards zone	10	„	
„ 200 to 300 „	16	„	(including 11 in the workhouse).
„ 300 to 400 „	5	„	
„ 400 to 500 „	3	„	
„ 500 to 600 „	—	„	
„ 600 to 700 „	1	„	
	40	cases.	

The iron hospital has three wards, two of them containing 16 beds each, and a smaller one with four beds, making a total of 36 beds. The building, which is of corrugated iron lined with wood, is erected in the grounds of the Borough sanatorium, and is situated less than 100 yards from it. It is about 250 yards from the workhouse.

The site of the sanatorium is on the slope of a valley which trends almost due north-east from the seashore at Hastings to Ore, a distance of a mile or more. The sanatorium and the iron pavilion are on the south side of the valley, about half way up the slope. At the bottom of the valley is a small brook and the railway line. The north side of the valley is little populated, except at the head or termination of the valley. The workouse stands on the north side of the valley in a direct line opposite the sanatorium. The village of Ore lies almost entirely to the east and north of the sanatorium, and occupies the south side and the head of this valley in which the hospital and workhouse stand. Some of the houses of Ore are within 200 yards of the iron pavilion. The Borough boundary, at its nearest point a little more than 200 yards from the hospital, runs for some distance along the crest of the southern slope of the valley; and from this crest the ground slopes sharply again seaward. In these circumstances air-borne infection swept by a north wind over the ridge would be liable to pass away to sea. But on the other hand, if the wind were from south or south-west it would blow direct from the pavilion on the south side of the valley to houses in a line with it to north-north-east, north-east, and east; and as the closed end of the valley is situated less than half a mile north-east from the hospital, there would probably be eddies formed and refluxion of air currents round the bowl-shaped end of the valley. Be this as it may, cases of small-pox were reported from the Ore valley in which the iron pavilion was situated, and not from the other parts of the neighbourhood.

With a view to calculating the incidence of small-pox upon the population of the 100 yard zones, I obtained, through the kindness of Dr. Sanderson, an estimate of the number of houses contained within each of these areas. The subjoined Table shows the number of houses existing within each such area round the iron hospital, and the number in each instance of these houses invaded by small-pox between January 22nd and March 22nd 1894:—

Within 100 yards of the pavilion there is one house, viz., the sanatorium, and it was invaded.

In the zone 100 to 200 yards of the pavilion there are 73 houses, and of these 7 were invaded - - - - -	= 9·5 %	= 5·5 %
In the zone 200 to 300 yards of the pavilion there are 119* houses, and of these 3 were invaded - - - -	= 2·5 %	
In the zone 300 to 400 yards of the pavilion there are 135 houses, and of these 4 were invaded - - - - -	= 3·0 %	= 1·6 %
In the zone 400 to 500 yards of the pavilion there are 222 houses, and of these 2 were invaded - - - - -	= 0·9 %	
Within a radius of 500 yards there are 550 houses, and of these 17 were invaded - - - - - - -	= 3·0 %	

* Including the workhouse.

As regards the incidence of the small-pox on the inhabitants of the several sub-areas I limit my consideration of the facts ascertained to the zones within 500 yards† of the hospital.

At the commencement of the small-pox outbreak, it is estimated that the population of the Borough sanatorium, including patients and officials, amounted to about 70, while that of the workhouse was about 218. Also it is estimated that each private ordinary dwelling contained on the average five persons. On this basis of calculation the incidence of small-pox attack on the inhabitants of the several areas was that shown in the following Table VI.:—

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† No case occurred in the 500–600 yards zone, and only one (in an unvaccinated infant) in 600–700 yards zone.

Distance from Small-pox Pavilion.	Estimated Population.	Cases of Small-pox.	Per-centage of Small-pox Attacks to Population.
Within 100 yards circle -	70	5*	7·1 per cent.
100 to 200 „ zone - -	365	10	2·7 „
200 to 300 „ „ -	810	16	1·9 „
300 to 400 „ „ - -	540	5	0·9 „
400 to 500 „ „ -	1,110	3	0·2 „
Within a radius of 500 yards	2,895	39	1·3 per cent.

* The cases of the two K.'s are included in this number, though perhaps they should have been omitted, since they were due to *direct* contact with small-pox cases *inside* the pavilion. Omitting them the per-centage of attacks within the 100 yards circle would be 4·2.

The three cases of small-pox at the Borough sanatorium, which is situated within 100 yards of the iron pavilion, occurred in *adults* occupying the two wards (one male, one female) directly facing the small-pox pavilion. In the female ward there were four beds, three occupied by children and one by a young woman aged 28. The window of the ward looked out upon the small-pox pavilion at a distance of less than 100 yards away. The young woman in this ward was confined to bed; she had no visible vaccination marks. She had a friend, a young woman aged 23, with three small faint vaccination scars, who was convalescent, and who, though she slept in a ward at the back part of the sanatorium, spent much of her time sitting with her sick friend in the ward facing the hospital. These girls both sickened with small-pox on the same day, January 23rd. On the opposite side of the landing (the wards referred to are on the first floor of the sanatorium) is the male ward that is in question, in which, at the time I speak of, there were seven patients in various stages of scarlatina. The eldest of these, a man aged 41, had been admitted on January 5th. He had three well marked vaccination scars. He was removed to the iron pavilion with small-pox on January 23rd. The other six patients in the ward with scarlatina are said to have been boys, with one exception, a young man of 21 or so; they had all, I understand, been vaccinated in infancy. No sign of disease likely to have been small-pox occurred in any of them. On January 23rd, as soon as the three cases of small-pox had been recognised, all remaining inmates of the sanatorium over 10 years of age were re vaccinated. All the operations were successful, and no further cases of small-pox followed in the sanatorium. The dates of admission to the sanatorium of the two female scarlatina patients who contracted small-pox were respectively, A. B., on November 20th, 1893, and E. E., on January 6th, 1894. It may be mentioned that one of the nurses at the sanatorium says that A. B., when she heard that a case of small-pox was in the iron pavilion (the first case, J. J., admitted January 6th), became very nervous about it, and constantly referred to it in conversation, saying she was afraid that she might catch that disease (small-pox). So far as I can learn, there can be no question that these young women contracted small-pox in the sanatorium. With regard to the male patient, inquiries elicited the following facts. He had been in London on a visit during the Christmas holidays, and returned to Hastings on January 1st or 2nd. He was admitted with scarlatina on the 5th. He lived in the same street in Hastings as that in which J. J., the first case, from Oldham, had temporarily lived for a

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day or two before he was removed to the pavilion. There was therefore just a faint possibility that he might have come in contact with and been infected by this small-pox case before he was taken to the sanatorium. I questioned the nurses who waited upon him, and I obtained a history of a "bilious" attack, with vomiting, on January 17th. A patient who was in the same ward at the time told one of the nurses subsequently that the day after the vomiting he "saw some spots on the man's *back*." He was not attended by Mr. Shorter, the visiting medical officer of the sanatorium, but by his own private attendant, who, owing to the fact that convalescence from the scarlatina had set in, did not see the case for four days (from the 19th, when the "bilious attack" was subsiding, till the 23rd). As he was subject to bilious attacks with vomiting, not much notice was taken of this passing illness. No spots were shown or spoken of to the medical attendant. But on the night of the 22nd there was a crop of "spots" on the man's face and small-pox was diagnosed. As the man died from hemorrhagic small-pox on February 2nd it is difficult to believe that the malady could have begun in so insidious a manner as to show, on the 17th or 18th of January, only "a few spots on the back," and none on the face till the 22nd. It is more probable that his "bilious" attack of the 17th or 18th was not the initial vomiting of the small-pox, and that renewal of his vomiting, happening about the 20th or 21st, was looked upon as part of the "bilious" attack. It is unfortunate that the case was not attended by the visiting medical officer, who is at the sanatorium daily, for then we should have had definite information as to the illness day by day. The nurses naturally, after the lapse of two months, and having no notes of the case, could not give me much help, and could not fix dates very definitely. It may be mentioned that the matron of the sanatorium, Mrs. Wells, was the first to recognise the small-pox eruption in this case, she having as a nurse had some experience of the disease in London. Though the source of this man's case is involved in some obscurity, yet, since no satisfactory explanation of the origin of the cases of the two young women in the adjoining ward is forthcoming, and as there was no evidence to point to any other explanation of this attack than aërial convection of infection, it is not unreasonable to suppose that if this was the cause of their illness it might also have been the cause of the man's, since the three cases appeared to develop almost simultaneously.

The officials of the sanatorium assured me that no communication was possible between those employed at the iron pavilion waiting on the first small-pox case and those nursing the scarlatina cases in the main building. There is a wall surrounding the sanatorium proper, and in it a door leading to the rest of the hospital grounds, in which the iron pavilion stands. This door was kept locked, so the superintendent says, and he kept the key and saw the food for the pavilion taken through the door and placed upon a table on the pavilion side of the enclosure, to be left there for the pavilion attendants to fetch. Someone, no doubt, might have broken the rules laid down, and have effected direct communication between the two buildings, but careful inquiry made by myself and separately by Dr. Wilson and the Sanitary Committee failed to discover proof of such occurrence. Since this was written, an allegation has been made by one official against another, that an attendant, while in charge of small-pox cases in the pavilion, used to go out in the evenings to walk about the streets and lanes at Ore without making any change of dress. The accuser had previously in the most solemn manner assured the Sanitary Committee, the Medical Officer of Health, and myself on several occasions that nothing of this kind could possibly have occurred. The charge was made after the accused had mentioned some breach of the regulations by the accuser.

When the three scarlatina convalescents in the sanatorium, having developed small-pox, were removed to the small-pox pavilion at the end of January, at least two of them were in the stage of scarlatina-desquamation. In the second week of February four children, two from the Borough and two from Ore, were admitted to the iron pavilion with mild small-pox. Three of them, aged respectively 12, 11, and 4, had each three vaccination marks, and in each instance the small-pox attack was of a mild character. The fourth child, aged 6, had never been vaccinated, and he had a confluent attack. Very shortly afterwards they were found to have contracted scarlatina in the hospital, but all of them recovered. Three scarlatina patients therefore contracted small-pox, and four small-pox cases got scarlatina, while under isolation by the Sanitary Authority.

The 11 workhouse cases occurred as follows:—Three on February 13th, one on February 14th, one on the 15th, and one on the 27th, two on March 2nd, one on March 4th, two on March 5th. The first recognised case was in a young woman who had been admitted to the workhouse on January 4th. She was confined of a baby on February 10th, small-pox attacked her on the 13th, and she died on the 20th; her unvaccinated baby also died of small-pox on the 23rd. This woman was a flower-seller, with no vaccination marks that could be discovered, and she had already had two other illegitimate children. While in the workhouse she worked in the laundry. She slept, previous to her confinement, in No. 7 ward. In this ward were 12 beds, and of the other occupants of it one, aged 48, with three faint vaccination scars, was attacked with small-pox also on February 13th, and another, aged 32, having two scars, on the 15th. In the adjoining ward, occupied mostly by children, a little boy, unvaccinated, aged 6, was attacked on February 14th, as were also a girl, aged 14, with two vaccination scars, and a younger girl, aged 7, unvaccinated, respectively on March 2nd and 4th. The cook to the workhouse, aged 23, with three scars, who slept in a private room on the same floor, and adjoining No. 7 ward, her window looking towards the sanatorium, developed small-pox on March 2nd. A woman, aged 55, with two faint scars, who was in a ward adjoining the lying-in room where A. G. was confined, and who had been near her after the confinement, developed small-pox on February 27th. This was the only case that was, without any doubt, referable to a previous case in the workhouse. Two old women, aged respectively 71 and 64, one with three scars, and the other with no visible vaccination marks, were attacked on March 3rd and 5th in another part of the building. The windows of the women's part of the workhouse face towards the sanatorium and the iron pavilion. I carefully examined the visitors' book kept at the gate to see if any clue could be found to the intoduction to the institution of the small-pox infection by members of affected families in Ore visiting friends in the workhouse, but without success. The casual wards are separate and distinct from the main building, and so far as could be made out there was no possibility of inter-communication between tramps coming to the casual wards and inmates of the main building. The master of the workhouse and the other officials stated that no inter-communcation had existed between themselves and the officials either of the sanatorium or of the iron pavilion. In a word, no explanation could be found of the development of the first cases in the workhouse except on the theory of aërial convection of the small-pox poison.

Coming to the earlier cases among the residents in private houses at Ore, one of the first families attacked had only lived in School Terrace, less than 300 yards from the hospital, for about three weeks; they came from another part of the district, where they had resided for years, and

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Dr. Sanderson and myself, by our inquiries, were able to exclude the possibility of this family having brought the disease with them to School Terrace. There occurred no fewer than four cases in this family, and all began on the same day, February 13th, on which day four other cases in other parts of Ore and in the workhouse were notified. After this date small-pox cases occurred at Ore in the neighbourhood of the iron pavilion, at irregular intervals, till the middle of April. Latterly there were several instances of secondary cases in families, and this helped to swell the number of notifications, since numerous foci of infection had been established by the middle of March.

It remains to state that the direction of the wind as observed in the locality was continuously from the S.W. and S., and that in January and February there were times when it blew a gale from these directions. The open end of the Ore valley is on the seashore at Hastings, and wind blowing from the S. and S.W. would blow up the valley without obstruction of any sort, passing the iron pavilion before reaching any dwelling in Ore. The following is a summary of the weekly weather reports for the early part of 1894:—

For the week ending—

January 13th.—Southerly winds generally, frequently increased to a gale.

" 20th.—Wind S.W. to W. Blew strong, attaining the force of a gale.

" 27th.—S.W. to N.W. winds prevalent. But a S.W. gale occurred during week.

February 2rd.—Wind fresh or strong S.W. to W., occasionally increased to a gale.

" 10th.—Strong S.W. to W. winds and gales.

" 17th.—S.W. to W. gales at first, towards end of week wind S. to S.E.

" 24th.—At first easterly winds, later on strong S.W. to W. gales.

From these observations it would appear that the wind had been blowing, almost persistently, during January and February, up the Ore valley, in a direction from the iron hospital towards the sanatorium, workhouse, and the more populous part of the parish of Ore. It is worth mentioning that several of the earlier Borough cases of small-pox were traced to visits to houses in Ore; and though in some Borough cases no contact with previous cases was proved, there was the possibility of their having been exposed to air-borne small-pox contagion when spending Sunday, *e.g.*, with friends at Ore.

Only one recognised case of small-pox occurred in the Hastings Rural Sanitary District beyond the parish of Ore. This exception was a woman aged 55, the wife of a gentleman's gardener living three miles from Ore in a cottage adjoining the high road. Her case was notified on April 1st. She had not been from home it was said for some weeks, and had had no visitors. Her daughter, however, took in washing weekly from Hastings. It is suspected that the malady may have been brought to the house by soiled linen. But the house is one that tramps and passers by sometimes call at, to beg or make inquiries; so that there may have been a chance infection by a stranger in this way, though it is not probable.

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On "Return" Cases of Scarlatina; by Mr. T. W. Thompson.

REPORT on RE-INVASION by SCARLATINA of HOUSEHOLDS to which PERSONS from the BROMLEY AND BECKENHAM JOINT HOSPITAL had RETURNED on their RECOVERY from that DISEASE; by Mr. T. W. THOMPSON.

In accordance with instructions, I attended, on the afternoon of January 29th, 1894, at the Local Offices, Bromley, Kent, a conference of representatives of the Bromley and Beckenham Joint Hospital Board, with representatives of the Constituent Authorities of that Board, viz., the Bromley and Beckenham Urban and the Bromley Rural Authorities.

The object of the conference was to discuss a complaint which had been made to the Joint Hospital Board by the Beckenham Urban Authority, to the effect that scarlatina had upon different occasions been re-introduced into previously invaded households within that Authority's District, by the return of children from the Joint Hospital.

Mr. R. G. Mullen, the Clerk, appeared on behalf of the Joint Board, which was also represented by Sir John Lennard, the Chairman, by Mr. R. A. Shannon, the Medical Superintendent of the hospital in question, and by the Matron of that institution.

The Beckenham Urban Authority was represented by Mr. Frederick Stevens, the Clerk, by Dr. George Carpenter, the Medical Officer of Health, by Drs. Corbin and Randell (Beckenham members of the Joint Hospital Board), who, as medical practitioners in Beckenham, had been professionally concerned with some of the cases connected with the complaint, and by Mr. G. Roots, the Inspector of Nuisances to the Beckenham Urban District.

There were also present the late Mr. Harris Butterfield, then Medical Officer of Health to the Bromley Rural District (West Kent Combined District), Dr. A. F. G. Codd, the Medical Officer of Health to the Bromley Urban District, Dr. Jones, a medical practitioner in the neighbourhood of Beckenham, Mr. J. H. Yolland, who had occasionally acted as Deputy Medical Superintendent of the Joint Hospital, and Mr. Matthew Bates, the Inspector of Nuisances to the Bromley Urban District.

It being found impossible to complete the conference on the afternoon of January 29th, it was adjourned to Monday, February 12th, 1894, throughout which day it was continued. But as the conference progressed, it became evident that the considerations involved were both various and complex, and that additional and somewhat comprehensive data were essential to any useful interpretation of the facts which had so far been brought forward. It was accordingly necessary to again adjourn the conference for the purpose of affording opportunity for the preparation of additional data, which were to include complete lists, arranged in certain specified form, and setting out information on various points, with respect to all cases of scarlatina notified during the years 1892 and 1893 in each of the three Constituent Districts comprising the Joint Hospital District. The preparation of these lists was readily undertaken by the officers to the Districts in question, but some delay of necessity occurred before they reached me in their complete form, and when they came to hand I was so fully engaged with other work that I found it impossible for a long time to resume the conference. There seemed, indeed, the less urgency with regard to the matter since I had reason to believe that instances of the apparent re-introduction of scarlatina into Beckenham households by the return of patients from the Joint Hospital, had, subsequent to January 1894, considerably decreased; and under these circumstances there appeared distinct advantage in further delaying the conclusion of the conference, and thus extending the experience as to the results of hospital isolation in the Joint Hospital District over an additional period. Thus it came about that I did not, until Monday, January 21st, 1895, pay a further visit to Bromley with a view to final conference, and for the purpose also of inspecting the Joint Hospital.

At the first of this series of conferences, that in January 1894, Mr. Stevens, the Clerk to the Beckenham Urban Authority, stated that during the period between the opening of the hospital (1885) and the year 1892, scarlatina had occasionally re-appeared in households shortly after the return to them of patients from hospital; that such instances had not then been numerous, scarlatina not being very prevalent during the period referred to; but that even at that time, Mr. Butterfield, who was then Medical Officer of Health to the Beckenham Urban District, had expressed the opinion that children had been sent out of the hospital in an infectious condition. During the year 1892, however, Mr. Stevens said that cases of the kind in question became much more frequent, and that, as a consequence, an inquiry into the matter was held by the Joint Hospital Board on January 20th, 1893; that at that inquiry evidence was taken on both sides; and that, in the end, the Chairman found it impossible to avoid the conclusion that patients had been sent out of hospital while still desquamating. As a result, application was made to the Local Government Board for a loan for the purpose of increasing the administrative accommodation at the hospital.

Having made this preliminary statement, Mr. Stevens proposed, he said, to limit himself for the most part to 10 instances, in which, between October 16th, 1892, and the date of the conference (January 29th, 1894), scarlatina had re-appeared in households shortly after the return to them of children from the Joint Hospital, which households, during the absence of those children in hospital, had remained free from the disease. A list of these 10 cases was put in and is annexed. (Addendum A.)

> [With respect to earlier cases, however, it may be mentioned here that at a later stage of the conference Mr. Harris Butterfield stated, in reply to Mr. Stevens, that upon four occasions (between December 1888 and May 1892), while he acted as Medical Officer of Health to the Beckenham Urban District, fresh cases of scarlatina occurred in households within that district shortly after the return of patients from the hospital in question. As regards the Bromley Rural District, for which he had for some years acted as Medical Officer of Health, Mr. Butterfield said that one case of the kind occurred in 1889, but none in either 1890 or 1891, except, perhaps, one doubtful case in the latter year. It will also be convenient to state at once that during the year 1892, as will be seen later, at least 10 of such cases occurred in the Bromley Rural District, and four in the Bromley Urban District.]

Continuing his opening remarks Mr. Stevens proceeded to maintain that during the period to which he had referred (October 16th, 1892, to January 29th, 1894), secondary cases of scarlatina had been far less frequent in the Beckenham District in households in which the initial cases had been treated at home than in households from which the initial cases had been removed to the Joint Hospital. And that this contention was well-founded will be seen later in this Report.

Mr. Stevens then explained that his Authority did not contend that re-infection of households in the way indicated could be entirely avoided, but maintained that such re-infections had been altogether excessive; the implication being that they had in large measure resulted from want

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of proper care on the part of the Medical Superintendent of the hospital. As tending to support this, he specially called attention to the fact that for six months after the inquiry into the matter by the Joint Hospital Board in January 1893, not a single case of the kind occurred in any of the Constituent Districts. He also pointed out that a batch of such secondary cases followed the return home of patients discharged between September 2nd and 9th, 1893, just before the Medical Superintendent of the Joint Hospital went for his holiday, and he called attention to the fact that five children were discharged on December 24th, 1892; the suggestion being that in both instances the discharge of the patients had not exclusively depended upon their fitness to leave the hospital.

In regard also to the suggested relation of these so-called "return cases" to a want of due care on the part of the Medical Superintendent in the discharge of patients, Mr. Stevens called attention to a quarterly statement of certain hospital proceedings, and notes thereon, which he had prepared, and which he put in. This statement, which covers the period of five quarters ending December 31st, 1893, will be found as Addendum B. So far as it goes, it indicates broadly a tendency to inverse ratio between the amount of time, calculated in minutes per patient, spent by the Medical Superintendent at the Joint Hospital and the occurrence of so-called "return cases." It also shows that the time, per patient, so spent at the hospital by the Medical Superintendent, was greatest during the two quarters following the inquiry by the Joint Board, to which reference has been made.*

In support of the view that the re-appearance of scarlet fever in the 10 households shown in Addendum A. did actually result from the return home from hospital, while still in an infectious condition, of the primary cases from those households, Mr. Stevens called Drs. Carpenter, Corbin, Randell, and Jones, by one or other of whom the majority of the children constituting the primary cases in question had been examined on the occurrence of secondary cases in their respective households. He also called Mr. Roots, the Inspector of Nuisances to the Beckenham Urban District, who had accompanied Dr. Carpenter, the Medical Officer of Health, on the occasions of such examinations of the recently discharged patients as that officer had performed. As a result it would appear that, at the time of the medical examinations in question, six of these children, viz., E. T., F. T., A. C., A. P., G. G., and W. H., exhibited some desquamation, and that two of these six, viz., E. T. and A. C., suffered also from nasal discharge. As regards a seventh child, W. B., no desquamation was detected, but this child, too, suffered from discharge from the nose. The nasal discharge in this case was, however, said to be chronic, and Dr. Jones, who gave evidence with regard to the matter, stated that the child was naturally delicate, and that he (Dr. Jones) had attended the boy for nasal discharge before his attack by scarlatina.

There was also evidence of a like kind as regards certain cases in the other Constituent Districts. In one case in the Bromley Rural District, for instance, it appeared from Mr. Butterfield's evidence that the child to whose return from this hospital tho re-appearance of the disease in the household was attributed, was found to be suffering from a discharge

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* At the final conference in January last, Mr. Stevens produced a diagram he had constructed, indicating the points above referred to, but at my request he undertook to extend it over a longer period and forward it to me later on. This he has since done, and his extended diagram, which is referred to on page 124 of this Report, will be found as Addendum E.

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from the ear. Two fresh cases occurred in this family, and both the patients were removed to the hospital. Fifteen days after the return together of these two patients—one of whom was afterwards found to be suffering from a roughness of the skin of the face and arms, which became of an eczematous character, and the other from sore throat—a further case occurred in the household. Another child, who also seemed to re-introduce scarlatina to a household in the Bromley Rural District on his return from the hospital, was suffering from slight eczema.

Dr. Codd, Medical Officer of Health to the Bromley Urban District, also stated that in one of the instances of scarlatina re-appearing in a house in his district shortly after the return of a child from the Joint Hospital, the child who had thus recently returned was found on examination to be suffering from a discharge from the nose, but there was no evidence of desquamation.

From the evidence thus adduced there would certainly appear to be decided *primâ facie* suggestion that a considerable proportion of the children in question may have been in an infectious condition when returned to their homes from the hospital, and in the case of E. T. and A. C., who, besides showing signs of desquamation, seem beyond doubt to have suffered, at the time of examination, from nasal discharge, the presumption to that effect obtains additional strength.

On the other hand, the question was seen to be arising as to how far the conditions exhibited by these children, as described at the conference, are to be safely regarded as conclusive evidence of infectiousness. The desquamation in some of the cases seems to have been slight and of a fine character. Thus, in the case of A. C.—which was really the determining cause of this conference—Dr. Carpenter found evidence of peeling of the skin in the armpit and a slight roughness of cuticle behind the ear. On the following day, however, neither Dr. Codd nor Mr. Yolland could find any desquamation in the armpit, though they still found some roughness behind the ear. Is it certain that infectiousness can be positively ascribed to slight and decidedly late desquamation of a kind such as this? Some authorities appear to be doubtful upon the point. In this case of A. C., for instance, the desquamation referred to by Dr. Carpenter was observed in the twelfth week after the child was attacked. She was admitted to hospital on July 2nd, and discharged eight weeks and six days later, viz., on September 2nd. She was examined as to peeling by Dr. Carpenter on September 18th—a fresh case having been notified in her home on September 16th. The Medical Superintendent was disposed to attribute the so-called desquamation observed at a late stage of convalescence in this and other cases to the frequent applications of carbolic oil to which the children had been subjected while in hospital.

Doubt may also be thought of as existing with respect to the infectiousness of late discharges from the nose, especially in such a case as that of the child W. B., who appears to have been previously subject to a discharge of similar kind. The difficulty of arriving at a definite conclusion on such a point is enhanced by the fact that, as regards scarlatina, bacteriology is not, as with diphtheria, in a position to readily detect, in material from the body of a patient, the microbic cause of the disease.

In an inquiry of this kind doubts of the sort above referred to should of course be taken into account, though it need hardly be said that in the absence of more definite knowledge of the subject, it is proper, for practical purposes, to assume infectiousness in any particular instance so long as any uncertainty remains. And in so far as it is safe to reason

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by analogy from recently acquired knowledge with respect to diphtheria, it seems at least probable that the mucous surfaces of scarlatina patients may in some cases remain a source of danger for considerable periods of time.

But in regard to the particular cases under consideration another question arises. Is it to be assumed that the children subsequently found to be desquamating, or suffering from discharge from the nose, were in such condition upon leaving the hospital? The Medical Superintendent avers that he examined all the children in question, stripped, on several occasions; that he was quite satisfied as to their fitness to be discharged; that all were then free from desquamation; and that in each case a paper to that effect was signed by the parent before the removal of the patient from the hospital. Most of the children in question had, moreover, been home a week before they were medically examined by the other practitioners referred to above, and some considerably longer. Thus: A. C. returned home from hospital on September 2nd, and was examined by Dr. Carpenter on September 18th; F. T. returned home on November 3rd, and was examined on November 30th; and G. G. returned home on December 17th, and was examined on January 10th. There would thus seem to have been ample time, in these instances, for a fresh shedding of the epidermis to have occurred in children as to whom that process appeared, at the time of their leaving hospital, to have ceased; or for the recurrence of a nasal catarrh which had seemingly subsided. In regard to this the Medical Officer of Health to the Beckenham Urban District appeared disposed to doubt the occurrence of recurrent desquamation, which he said had not come within his own experience. But the fact of its liability to occur is very definitely stated by some authorities.

In this connexion the case of some children, named P., who are considered, and certainly not without reason, to have introduced scarlatina into a house in a borough in the south of England, during 1894, on their arrival there from the Bromley and Beckenham Hospital, is not without interest. (*See* correspondence and medical certificates annexed (Addendum C.).) These children proceeded from the hospital to the South of England on April 28th, after a stay in the Joint Hospital of nine weeks; and on May 2nd another child in the house at which they had arrived sickened with scarlatina. On May 7th the two children from the Bromley and Beckenham Hospital were specially examined by the Medical Officer of Health to the borough in question, with the result that one of them, a boy, was found to exhibit "a considerable "quantity of fine peeling on the arms and sides," but the other, a girl, was certified to be, as far as could be seen, "quite free from any roughness or peeling," notwithstanding that she was examined with a lens. Two days later these children were examined by two other medical practitioners, on behalf apparently of the Beckenham Local Board, from whose district the children had been removed to hospital; and now the girl, as well as the boy, was certified to be peeling; a statement supported also by the borough Medical Officer of Health who had examined her two days previously with a negative result, but who states in a later letter, that at his subsequent visit "the fact that she was "still desquamating was very obvious." To complete the story, it will be seen from the annexed certificates that five days after examination by the two practitioners above referred to, both the children were certified by another practitioner in the borough, who examined them also with a lens, apparently on behalf of the Medical Superintendent of the Bromley and Beckenham Hospital, to be free from all trace of desquamation. It should also be added that these children, who had

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been at least nine weeks in hospital, had both been examined on April 26th, two days before they left that institution for the South of England, not only by the Medical Superintendent, but also by Mr. Yolland, both of whom considered that the children were then completely free from desquamation; and the mother on taking them from the hospital signed a paper, after examining them, to the same effect. According to the certificates, therefore, these two children were seemingly subject to recurrent and transient desquamation.

As bearing upon the question of recurrence of certain of the phenomena of scarlatina another case may be mentioned. Although, as already said, Mr. Stevens was content to deal with the 10 cases shown in Addendum A., as occurring between October 1892 and January 1894, it will be seen that his table includes an earlier case, that of G. B. W., who was removed to hospital in March 1892. This child remained eight weeks in hospital. Eight days after his return home, a fresh case having occurred in the household, this child was examined by Dr. Jones, and found, as Dr. Jones stated at the conference, to be suffering from acute bronchitis and fever, *with soreness of the throat and tenderness of the cervical glands*. There was also some fine desquamation on the chest, arms, and legs.

I may here point out that the data afforded in Mr. Stevens's table (Addendum A.) do not appear to suggest any general want of caution on the part of the Medical Superintendent as regards the length of time the patients were retained in hospital. One case was discharged in the seventh week, and one in the eighth week, but all the rest remained over eight weeks in hospital; two of them over nine weeks, and one more than twelve weeks. And this brings me to a consideration of the routine procedures at the hospital in question, which were detailed by the Medical Superintendent at the adjourned conference in February 1894.

These were stated to be as follows:—

On the arrival of the ambulance at a house for the purpose of removing a patient, Notice No. 1 (Addendum D.) is handed to the patient's relatives. The patient, wearing only a night-dress, but wrapped in blankets specially sent in the ambulance, is then removed to hospital. On arrival at hospital he is put to bed and kept there for three weeks, during which period the process of desquamation is observed and the urine examined as occasion demands. During the third week occasional baths are commenced. At the expiration of three weeks the urine is in all cases examined, and the patient, unless any contra-indication exists, is allowed to get up. He now commences to have a bath every second day. At the end of about the sixth week he is specially examined (naked and in bed) by the Medical Superintendent, as to desquamation, especially of the feet; and the urine is again tested. If the Medical Superintendent is satisfied that the process of desquamation is completed, the patient is transferred to the convalescent block. Before going to this block he has a bath, and is provided with a fresh suit of hospital clothing from the administrative block. In the convalescent block, where he is under the care of a trained nurse, he has a bath every day, after which his body is rubbed with a mixture of carbolic oil and eucalyptus oil. Towards the end of a stay of a fortnight in the convalescent block (eight weeks from the date of his admission to hospital), the patient is stripped and again specially examined by the Medical Superintendent. If now considered fit for discharge, a letter enclosing Form 2 (Addendum D.) is sent by the matron to his relatives fixing a time for his removal. A day or so before actual discharge he is again seen by the Medical Superintendent,

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who also, if possible, attends on the occasion of his departure. The latter practice, however, was not adopted until towards the end of 1892, but the Medical Superintendent stated that for the four months preceding the second conference in February 1894, he had been present at the discharge of every patient. On the arrival of the relatives, the patient is taken to a specially-arranged "discharging department," consisting of an entrance room leading to a bath room, which in turn leads to a discharging room. The patient having deposited his hospital clothing in the entrance room, receives a final bath and oiling, and proceeds to the discharging room, where the Medical Superintendent and the mother, or other relative, are waiting. The patient is then again examined by the Medical Superintendent and by the relative present, the latter of whom is requested to sign Form 3 (Addendum D.). The patient is then dressed by the relative, in clothes freshly brought from home for the purpose, and is allowed to leave—a copy of Form 4 (Addendum D.) being in all cases given to the relative. If it can be avoided no officer of the hospital touches the patient after the final bath. No clothing used by the patient in hospital is allowed to leave the hospital, the night-dress in which the patient arrived being destroyed.

If during his stay in the convalescent block there should appear reason for such procedure, the patient is sent back to the fever ward.

Cross-examined with regard to a letter of his, dated October 11th, 1893, in which occurs a statement to the effect that he has nothing to do with discharge from the nose, the Medical Superintendent stated that this had reference only to the controversy respecting A. C., as the Medical Officer of Health had not raised the point in that case. In his hospital practice he always, he said, if possible, refuses to allow any patient to leave the hospital while suffering from any discharge from the ear or nose; following, in this matter, the advice of the Medical Superintendent of a large London Fever Hospital whom he consulted on the subject. On this account he has kept a child in hospital as long as 18 weeks. If such discharge becomes chronic and it is impossible, owing to the demand for beds, to keep the patient any longer in hospital, the Medical Superintendent then makes a special note on Form 4 as to exceptional precautions to be observed in regard to the case. He also specially advises that such patient be sent for a time to a house at which there are no children; and to facilitate this the hospital authorities give the parents the names and addresses of suitable persons who will take convalescents for 5*s.* a week each. In order that every possible precaution should be adopted at this hospital, the Medical Superintendent stated that he had, with a view to obtaining further suggestions on the matter, written to the medical papers and visited every fever hospital in London.

On the occasion of my final visit to Bromley, on January 21st, 1895, the Medical Superintendent stated that the above regime had been carried out for several years except as regards the following matters:—

1. Until the end of 1892 patients were allowed to come to the hospital in their ordinary clothes, which were disinfected in the Ransom's stove at the hospital, and kept in the administrative block till required for the patient's discharge. At that time also any additional clothing the patient was likely to require on leaving the hospital was sent to the hospital a few days prior to the patient's departure, disinfected in the stove in question, and retained in the administrative block till required. This system was, however, given up at the end of 1892, and the present

practice adopted of allowing no clothing but the night-dress to be brought to hospital with the patient, and permitting nothing used by the patient while in hospital to leave that institution; it having been thought that in one case infection from the hospital had been carried home in the clothing thus retained there.

2. Until November 1892 relatives were allowed to visit the hospital for the purpose of seeing patients through the windows of the convalescent block. Since that time, however, no visiting has been allowed at all except in serious cases.

3. Since the former conferences in 1894 some modification of the system of oiling patients has been adopted. Patients are now oiled before, instead of after, each bath, and the oiling is practised while they are in the fever wards, but discontinued in the convalescent block, as the Medical Superintendent believed that when continued till the date of discharge a roughness of the skin resulted, which was often afterwards mistaken for the desquamation of scarlatina. It also appears that until additional bathing accommodation was provided for the fever and isolation pavilions, at the end of 1893, patients did not always, while in the fever pavilion, receive the number of baths (a bath every second day) described as given to them from the fourth to the sixth week of their stay in hospital, though they usually, it is said, had two baths a week. Even then, the matron states, on being transferred to the convalescent block all patients had a bath daily. At times of pressure, during 1892 and 1893, it also appears that some few patients, who were known to be going for a period—prior to their return home—to houses where there were no children, were only kept in the convalescent block a week; but all other patients were retained there a fortnight.

As regards attention to the throats of patients, the Medical Superintendent states that since the year 1890 it has been his practice to examine the throats of all patients before they are transferred from the fever ward to the convalescent block and again before they are discharged from hospital.

The above account of the precautionary measures adopted at this institution seems to emphasize the need for caution in attributing so-called return cases of scarlatina, such as those now under consideration, to defective hospital administration. And in this connexion the facts and considerations about to follow seem of no little importance.

I have already stated that at my request complete lists of all the cases notified in each of the Constituent Districts, during the years 1892 and 1893, were prepared for me, setting out information as to various points.

I have carefully analysed these lists, and from the data thus obtained I have prepared Tables A (1), B (1), and C (1), which refer to the year 1892, and Tables A (2), B (2), and C (2), which give the corresponding facts for 1893. (*See* pages 114–116.)

It seems desirable in the first instance to give some explanatory account of these tables before proceeding to discuss the interpretation of them.

In each of the six tables I have divided the invaded households into two classes, viz.:—Class I., in which the primary cases were removed to hospital; and Class II., in which they were treated at home.

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In Tables A (1) and A (2), I have shown, for 1892 and 1893, respectively, for each class of household, the total number of households invaded by scarlatina, and the number in which secondary cases occurred; secondary cases, in this instance, meaning *all* cases (irrespective of any limit in point of time) occurring in previously invaded households subsequently to the date of the notification of the primary case of the household.

Data of this sort were a necessary preliminary to study of the subject, though of course as indications of the influence respectively of "home" and "hospital" isolation in securing invaded households against spread in them of scarlatina, they are not to be relied on. And for this reason, many of the secondary cases in the "hospital" class of households, for instance, might have occurred at dates which entirely exonerated hospital isolation from any share in their causation, and such cases would have no validity as evidence of any influence of hospital isolation in the spread of the disease. It seemed to me, therefore, more to the purpose to compare together, if possible, the proportion of each class of households in which there occurred secondary cases which, judging from the dates of their occurrence, might with some reason be regarded as dependent upon "hospital" and "home" isolation respectively. To do this it was necessary as far as possible to exclude from consideration, in both classes of households, instances of multiple invasion which might have been due to simultaneous primary infection, as well as instances of secondary invasion which might be reasonably thought of as due to infection received from the primary cases before the primary cases had been, as regards Class I., or might have been, as regards Class II., removed to hospital. Similarly it appeared necessary to exclude those instances of secondary invasion in which the secondary cases, judging by the dates of their occurrence, were, if contracted at home, probably, and as regards some in Class I., certainly, due to the imperfect disinfection of the dwelling and its contents.

I have attempted such a comparison for each of the years in question in Tables B (1) and B (2), and the method I have adopted is as follows:—

As regards the hospital isolation class I have given—

(*a.*) The total number (for each year) of households primarily invaded.

(*b.*) The number of such households in which secondary cases were notified within 21 days in each instance, after the return home of the primary cases from hospital.

The rationale of my (*b.*) group is of course that any cases occurring in a household after the removal of the primary case or cases, and before the return of such persons from hospital, must, if connected with the primary case at all, have been contracted either simultaneously with the primary case, or from the primary case before its removal to hospital, or from infection retained in the dwelling (*i.e.*, imperfect disinfection); in neither of which instances could any blame be attributed to hospital isolation—unless, indeed, the hospital authorities were guilty of tardiness in removing patients, which does not seem to have been the case in this instance.* Upon this view, therefore, the

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* The large majority of the cases were removed on the date of notification. It might of course be urged that during the absence of the primary case in hospital, infection might be carried back to the dwelling through members of the household visiting the patient in hospital. But the chance of this must, I think, be very small as compared with the risk which is incurred by susceptible inmates of the dwelling when the primary case is retained at home through illness.

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only cases practically valid as evidence of spread of the disease by hospital procedures in the households of Class I. are cases occurring after the return, on recovery, of the primary cases from hospital. But the question arises as to how long after the return of such persons fresh cases in the household should be attributed to their return. This of course is a difficult point. If too long a time is allowed many cases really contracted from other and independent sources are doubtless included among so-called "return cases." Allowing on the one hand for the circumstance that susceptible persons in the household need not necessarily take infection immediately on the return of the patient from hospital (especially if the fact of their becoming infected is sometimes due to a recrudescence of infectivity on the part of the recently returned hospital patient), and noting on the other hand that the maximum period of incubation in scarlet fever is apparently seven days, I have considered that 21 days is a liberal time to allow for the infection of fresh cases in a household by a patient returned from hospital, and that new cases in such a household occurring after that period are more probably due to new sources of infection.*

As regards the "home" isolated class in Tables B (1) and B (2) I have for like reasons given—

(*a.*) The total number of houses primarily invaded.

(*b.*) The number of such households in which secondary cases were notified between the 6th and 56th days after the notification of the primary cases.

By excluding all secondary cases notified before the 6th day after notification of the first case, I have intended to eliminate almost all instances of cases infected simultaneously with the first case, and the majority also of those secondary cases due to infection from the primary case before such case *could* have been removed to hospital—secondary invasions which, of course, are in no way to be attributed to the practice of home isolation. And the rationale of my procedure has been, on the one hand, that the primary cases could not be notified until the appearance of the rash on the second day of the disease, and that they are often, no doubt, not notified until later; and on the other hand, ha t the period of incubation of scarlet fever, though it not unfrequently extends to four, five, or even six days, and occasionlly to seven days, is usually less than three days.†

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* Many will think the period here adopted (21 days) excessive, but under the circumstances it seemed best to risk error in that direction.

† In this matter I adhere to the conclusion set out in the Clinical Society's recent report. To ensure in the "home" isolated class the absolute exclusion of *all* cases simultaneously contracted with the first case, and of *all* cases contracted from the first case before that case might have been removed to hospital, it would be necessary to extend the period I have adopted by several days. But that would be open to obvious objections. Cases notified on the 7th day after the first notification might, for instance, quite likely have been contracted on the 3rd or 4th day after such notification, *i.e.*, *after* the first patient would almost certainly have been removed to hospital had hospital isolation been resorted to. And, indeed, considering the usually short period of incubation of scarlatina, even my allowance of five clear days from the date of the first notification does doubtless exclude some cases which were contracted from the first case after it might have been removed to hospital, and which should therefore be credited to home isolation; and such cases

> As regards my "far-time limit" in the "home isolation" class, the 56th day is taken as representing the close of the usual period (eight weeks) patients are retained in hospital if sent there. It is of course not completely satisfactory, as cases of unusually prolonged infectiousness might, as a result of home isolation, give rise to the infection of others at dates later than the 56th day. It was necessary, however, to fix some limit.

In one respect the comparison effected in Tables B. contains a source of error and may be thought to tell unfairly against home isolation. By disregarding in the hospital isolated class attacks which occur in households *after* the removal from them of their primary case or cases, and *before* the return of such persons from hospital—a period of usually some eight weeks—a certain number of households in which cases occurred during this interval as a result of infection from some outside source, are, as indeed it is intended that they should be, excluded from consideration, whereas no equivalent deduction is made in the home isolation class. Theoretically no doubt this involves a difficulty which it is impossible to entirely eliminate. Practically, however, it would hardly seem that it need be looked upon as having important consequences. For it is obvious that any cases which occur in invaded households, say, between the 6th and the 56th days after notification of the first case, are much more likely to be due to infection from outside sources in the "hospital" than in the "home" class of households. In the former class the inmates, owing to the removal of the primary case to hospital and the consequently earlier disinfection of the dwelling, are able the sooner to resume their ordinary intercourse with the outside community—the children, for instance, returning the earlier to school. In the latter class, intercourse with the outside community is presumably as far as possible curtailed—especially as regards school attendance—during the whole period of the home isolated illness. Except, therefore, in so far as milk epidemics are concerned, the presumption is that secondary cases, occurring in "home isolation" households during the course of the illness therein of the primary case, are much more often due to direct or indirect infection from such primary case than to infection from outside sources. To whatever extent, however, the source of error above referred to may be considered to invalidate, for general application in inquiries of this sort, the method here pursued, it is, owing to the special circumstances of the case, of little moment in the present inquiry, and the comparisons instituted in Tables B. serve, I think, to illustrate a point of considerable importance.

Having in Tables B. compared the "hospital isolation" with the "home isolation" dwellings, as regards the occurrence in them of secondary invasions which might reasonably be looked upon as connected with hospital and with home isolation respectively, it seemed to me important to ascertain as accurately as may be whether the data adduced in aid of my inquiry afford any ground for supposing that *apart from any influence of hospital isolation*, the "hospital" class of households

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(Footnote—*continued.*)
may safely be regarded as the equivalent of those which, although contracted on or before the date of the first notification, were not notified until the 6th or 7th day after that date. On the whole then, five clear days from the date of the first notification seem to me a fair time to allow for the exclusion of cases contracted simultaneously with the first case, or from the first case before such could have been removed to hospital—the point being that in the large majority of cases the incubation period is three days or less.

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TABLE A (1), showing for each of the Constituent Districts, in the year 1892, the Number of Households invaded by Scarlatina, and the Number and Per-centage of such Households in which Secondary Cases occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
Class I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	28	42	69	139	—	—	—	—
	(b.)	Number of (a.) in which secondary cases occurred.	11	13	23	47	39·2	30·9	33·3	33·3
Class II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	20	21	49	90	—	—	—	—
	(d.)	Number of (c.) in which secondary cases occurred.	1	2	6	9	5·0	9·5	12·2	10·0

TABLE B (1), showing for each of the Constituent Districts, in the year 1892, the Number of Households invaded by Scarlatina, and the Number and Per-centage of such Households in which Secondary Cases, selected as indicated in the Table, occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
Class I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	28	42	69	139	—	—	—	—
	(b.)	Number of (a.) in which secondary cases were notified within 21 days after the return of primary cases from hospital.	4	7	10*	21	14·2	16·6	14·4	15·1
Class II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	20	21	49	90	—	—	—	—
	(d.)	Number of (c.) in which secondary cases were notified between the 6th and 56th days inclusive, after the notification of the primary case.	—	2	3	5	—	9·5	6·1	5·5

* Cases of the kind indicated in (b.) occurred on two separate occasions in one of the 69 households of Class I. The second of these occurrences is not included in the 10 shown.

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TABLE C (1), showing for each of the CONSTITUENT DISTRICTS, in the year 1892, the NUMBER of HOUSEHOLDS invaded by SCARLATINA, and the NUMBER and PER-CENTAGE of such HOUSEHOLDS in which SECONDARY CASES, selected as indicated in the Table, occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
CLASS I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	28	42	69	139	—	—	—	—
	(b.)	Number of (a.) in which secondary cases were notified after the removal to hospital and before the return home of the primary cases.	7	6	13	26	25·0	14·2	18·8	18·7
CLASS II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	20	21	49	90	—	—	—	—
	(d.)	Number of (c.) in which secondary cases occurred.	1	2	6	9	5·0	9·5	12·2	10·0

TABLE A (2), showing for each of the CONSTITUENT DISTRICTS, in the year 1893, the NUMBER of HOUSEHOLDS invaded by SCARLATINA, and the NUMBER and PER-CENTAGE of such HOUSEHOLDS in which SECONDARY CASES occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
CLASS I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	57	66	36	159	—	—	—	—
	(b.)	Number of (a.) in which secondary cases occurred.	12	14	7	33	21·0	21·2	19·4	20·7
CLASS II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	29	51	43	123	—	—	—	—
	(d.)	Number of (c.) in which secondary cases occurred.	6	6	7	19	20·6	11·7	16·2	15·4

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TABLE B (2), showing for each of the CONSTITUENT DISTRICTS, in the year 1893, the NUMBER of HOUSEHOLDS invaded by SCARLATINA, and the NUMBER and PER-CENTAGE of such HOUSEHOLDS in which SECONDARY CASES, selected as indicated in the Table, occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
CLASS I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	57	66	36	159	—	—	—	—
	(b.)	Number of (a.) in which secondary cases were notified within 21 days after the return of the primary cases from hospital.	1	4	1	6	1·7	6·0	2·7	3·7
CLASS II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	29	51	43	123	—	—	—	—
	(d.)	Number of (c.) in which secondary cases were notified between the 6th and 56th days inclusive, after the notification of the primary cases.	4	4	5	13	13·7	7·8	11·6	10·5

TABLE C (2), showing for each of the CONSTITUENT DISTRICTS, in the year 1893, the NUMBER of HOUSEHOLDS invaded by SCARLATINA, and the NUMBER and PER-CENTAGE of such HOUSEHOLDS in which SECONDARY CASES, selected as indicated in the Table, occurred; the Households being arranged in Two Classes, according as the Primary Cases were removed to Hospital or were treated at Home.

—			Number of Households.				Per-centage of Total Households of the Class.			
			Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.	Bromley Urban.	Beckenham Urban.	Bromley Rural.	Total.
CLASS I. In which the primary cases were removed to hospital.	(a.)	Number of households primarily invaded.	57	66	36	159	—	—	—	—
	(b.)	Number of (a.) in which secondary cases were notified after the removal to hospital and before the return home of the primary cases.	8	9	6	23	14·0	13·6	16·6	14·4
CLASS II. In which the primary cases were treated at home.	(c.)	Number of households primarily invaded.	29	51	43	123	—	—	—	—
	(d.)	Number of (c.) in which secondary cases occurred.	6	6	7	19	20·6	11·7	16·2	15·4

was subject to any excess of scarlatina invasion as compared with the "home" class. And accordingly I constructed Tables C (1) and C (2). In these tables I have, as before, shown for each class of households, for the years 1892 and 1893, the number primarily invaded. Further, I have shown, as regards the "hospital class," the number in which secondary cases were notified after the removal to hospital and before the return home of the primary cases. In the "home" class I ought, if possible, to have shown the number of households in which secondary cases occurred independently of home isolation influence. But this was for obvious reasons difficult, and I have been content to show the total households secondarily invaded. Such error as is involved here—and it is probably of far greater magnitude than that pointed out as regards Table B.—clearly tells, for present purposes, against the "hospital" class, for it tends to obscure any excess of secondary invasion by scarlatina to which that class was intrinsically subject, if subject to such it was. And as the result shows, the comparison sufficiently serves the purpose for which it was instituted despite the error involved, though perhaps the method would not be generally applicable in other inquiries.

I now proceed to consider the results of my analysis as shown in the tables above described.

With reference to the year 1892:—

From Table A (1) it is seen that the per-centage of households in which secondary cases occurred was very conspicuously greater in the class of households from which the primary cases were removed to hospital than in the class of households in which the primary cases were treated at home; and that this was true of each of the three Constituent Districts. The contrast as exhibited in the table is certainly at first sight somewhat startling, so much so indeed as to suggest at once that it is largely due to the smallness of the figures and to the consequently prominent influence of some disturbing factor or factors. For even assuming that the dwellings from which cases are removed to hospital are, as a rule, of a less well-to-do class—and thus of a class in which for various reasons secondary cases are more likely to occur—it can hardly be supposed that the result here obtained represents the usual relative incidence of secondary invasion upon "hospital" and upon "home" isolation households elsewhere. Hence the importance of Tables B. and C.

Now Table B (1) shows that when comparison is made of the proportion of households in Class I. wherein occurred secondary cases which, judging from the dates of their occurrence, might have resulted from hospital proceedings, with the proportion of households secondarily invaded in Class II., as a consequence probably of home isolation proceedings, the incidence of secondary invasion of the kinds now in question is still notably greater upon the "hospital" class than upon the "home" class.

But the considerable reduction in the proportion of secondarily invaded households in Class I., which is exhibited in Table B (1), as compared with Table A (1), suggests, what is indeed shown in Table C (1), that during 1892 the "hospital" class of households, *altogether apart from any question of hospital isolation,* was more subject to secondary invasion by scarlatina than the "home" isolation class. According to Table C (1), that *portion* only of the secondary invasions of hospital households which is shown in the table—the *portion* more-

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over which could have had no connexion with hospital proceedings—exceeds the *total* secondary invasions of the home isolation households.*

The question therefore arises as to how far the so-called "return cases" of 1892 were really consequent upon the return of patients from hospital, and how far they were due to some other factor or factors, which, according to Table C., were, it would seem, operating excessively upon this hospital class, so as to give rise to the greater proportion of secondarily invaded households in that class apart from any hospital influence.

In considering this question some light may perhaps be obtained from details of the experience of the next succeeding year, 1893.

From Table A (2) it will be seen that the experience of 1893 differed considerably from that of 1892, in that the excess of incidence of secondary invasion upon the "hospital" class of households, though still discernible, was reduced to much smaller proportions. Coincidently too, as exhibited in Table B (2), there occurred in 1893 a large diminution in the so-called "return cases": and meanwhile the secondary invasions of households of the "hospital" class occurring at dates which exonerate the hospital from any share in their production (Table C (2), Class I.), instead of being, as in 1892, notably in excess (relatively to the number of households invaded in each class) of the total secondary invasions of households of the "home isolation" class, were now in 1893 about equivalent to such total secondary invasions.

It is true that the figures with which the tables for these years deal are small, even when the three districts are treated collectively, and I therefore abstain from any attempt to draw very definite inferences from them, more especially with regard to the individual districts. At the same time I cannot but think that the facts recorded in the tables tend to indicate that the "hospital isolation" class of households was subject, particularly in the year 1892, to some source of, or opportunities for, infection, *altogether apart from any influence of hospital procedure*, which did not operate equally in the case of the "home isolation" class of households. Wherefore it seems not unreasonable to suppose that this factor, which appears to have been capable of causing an excessive incidence of secondary invasion on the "hospital" class of households, at dates which exempt the hospital from any blame in connexion therewith, probably gave rise also to some share of the so-called "return cases."

To trace, and to estimate the influence of, the factor or factors which seem to have thus operated in excess upon hospital households would be a difficult matter, and one, moreover, which would require opportunities of more detailed local investigation than were afforded by the conditions of the conferences to which this report relates. And it is indeed doubtful whether, in view of the time which has now elapsed since the factors in question appear to have been in appreciable operation (mainly 1892), the most complete investigation would now yield satisfactory results. The points, however, which suggested themselves to me as deserving of some general inquiry in this connexion, and in the hope of obtaining some further indication as to the causation of the so-called return cases, were as follows:—

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* It should especially be noted that, as already explained above, Tables C (1) and C (2) show only a portion of the total secondary cases which occurred in the "hospital" class of households, viz., that portion which occurred after the removal to hospital and before the return home of the primary cases; whereas, in the case of the "home" isolation class of households, Tables C. show the total secondary cases which occurred in households of that class.

(*a.*) The general character of the dwellings of the two classes.

(*b.*) The relative number of susceptible inmates [*i.e.*, of children] in the two classes of households.

(*c.*) The possible influence of infected milk supplies.

(*d.*) The possible influence of attendance at particular schools.

(*e.*) The possible influence of variations in the infectivity of the disease at different periods of the epidemic, and difference of opportunity for its incidence upon one and the other class of households.

Questions, too, as to difference of procedure in regard to disinfection of households of the two classes were also taken into account, as well as the possibility of some relation subsisting between the number of patients in hospital and the liability of these persons to carry infection with them on leaving that institution.

As a result of such inquiries it would appear in regard to (*a.*) that the average rateable value of the houses from which patients were removed to hospital was considerably lower than that of the houses in which patients were treated at home; and in regard to (*b.*) that the average number of children residing in the houses of the former class was greater than in that of the latter class. This seems to have been true for each of the Constituent Districts in each of the years (1892 and 1893) under consideration. So far as I have been able to ascertain from the data supplied to me, the relative positions of the two classes of houses in these respects were as represented in Tables D. and E. Here then are two factors which may reasonably be looked upon as accounting for some proportion of the excess of secondary invasion to which the "hospital isolation" class of households was subject as compared with the "home isolation" class, though they would not appear to afford adequate explanation of the different experience in this respect between the years 1892 and 1893.

TABLE D., showing, separately for each of the CONSTITUENT DISTRICTS, and for these districts collectively, the MEAN RATEABLE VALUE of the "HOME ISOLATION" and "HOSPITAL ISOLATION" HOUSES for the Two Years 1892 and 1893.

District.	Mean Rateable Value.			
	1892.		1893.	
	Home Isolation Houses.	Hospital Isolation Houses.	Home Isolation Houses.	Hospital Isolation Houses.
	£	£	£	£
Bromley Urban - -	32	18	45	18
Beckenham Urban -	43	25	69	29
Bromley Rural - -	63	14	48	19
Mean of the three districts	46	19	54	22

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TABLE E., showing, separately for each of the CONSTITUENT DISTRICTS, and for these districts collectively, the AVERAGE NUMBER of CHILDREN residing in the "HOME ISOLATION" and "HOSPITAL ISOLATION" HOUSES invaded with SCARLATINA in the Two Years 1892 and 1893.

District.	Average Number of Children in Houses.			
	1892.		1893.	
	Home Isolation Houses.	Hospital Isolation Houses.	Home Isolation Houses.	Hospital Isolation Houses.
Bromley Urban - -	2·9	3·8	2·6	3·5
Beckenham Urban - -	2·2	2·9	2·2	2·7
Bromley Rural - -	2·5	4·1	1·9	3·4
Average - -	2·5	3·6	2·2	3·2

As regards (*c.*) above I did not meet with any evidence to suggest that the excessive incidence of secondary invasion upon the "hospital" class of households, especially in 1892, is to be attributed to infected milk supply. A few cases of scarlatina in the Bromley Rural District in 1892 were assigned by the Medical Officer of Health to this cause, but they were apparently confined to the "home isolation" class of households. And as regards the two Urban Districts I heard of no important operation of infected milk. One particular milk supply in the Beckenham Urban District is thought to have for a time communicated the disease—the milk in this instance having, it is believed, been infected through the agency of a child recently returned from the hospital. This accident, however, occurred at a time which seems to render it impossible that it could have been concerned in the causation of the Beckenham "return cases."

In regard to (*d.*) the data at my command do not admit of any precise estimate of the influence of school attendance. From the information supplied to me respecting the two Urban Districts, however, there would appear good reason for the view that attendance at particular schools did contribute not a little to the excessive incidence of scarlatina upon the "hospital" class of households. In the first place, as might have been expected, attendance at public elementary schools was more the rule among children of the "hospital" isolation class than among those of the "home" isolation class, and this was very notably the case in the Beckenham Urban District in the year 1892. It appears, moreover, that during that year at Beckenham, 76 per cent. of all the notified cases of scarlatina of the "hospital" class were pupils of the Bromley Road School; whereas of the Beckenham "home isolation" class during the same period only 8 per cent. attended the particular school in question. And that this school was locally regarded as a factor in the dissemination of scarlatina during 1892 is clear from the fact that it was closed for a month from September 13th of that year, on account

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of scarlatina prevalence among the scholars. Further study of the data supplied to me in regard to school attendance tends to arouse definite suspicion that certain of the children in both the Beckenham and Bromley Urban Districts, whose attacks of scarlatina occurred shortly after the return to their dwellings of patients discharged from the Joint Hospital, may have been exposed about that time to opportunity of scarlatina infection by attendance at particular schools. On the other hand, the possibility of scarlatina having at times been reintroduced into schools by children resuming attendance on their return from the hospital must not be lost sight of, and the data before me would seem to be not inconsistent with this having in certain instances occurred. In the absence of more detailed information, however, it is impossible to speak very definitely on these points.

In regard to (*e.*) it appears that the so-called "return cases" with which this report is concerned occurred in the course of a widespread prevalence of scarlatina which, as regards these districts taken collectively, attained its climax in 1893, after which it largely declined. Judging from the statistics of the Joint Hospital it would appear, too, that the epidemic attained its maximum fatality, as well as its maximum prevalence, during that year. And it is a point not without significance, as it appears to me, that the so-called "return cases" were mainly limited to the two years of the rise and climax of the epidemic (1892 and 1893) and for the most part to the former of those years. The decline, as compared with the two former years, in the occurrence of these cases, which, according to information recently received from the officials of the three Districts in question, I find occurred in the year 1894, may of course be attributable to causes other than those connected with the phase of the epidemic; but it is at least significant that the experience of 1894 shows also a notable decline in the occurrence of secondary invasion of households generally. Thus: Of the total households primarily invaded during 1894 in the two Urban Districts* it appears that secondary cases of one or another sort occurred in only 8·3 per cent., as compared with 18·7 per cent. in 1893, and 24·3 per cent. in 1892.

In considering the question of the possible operation of factors associated with the natural history of scarlatina, it should also be pointed out that both in 1892 and 1893 the large majority of the so-called "return cases" occurred during the latter half of the year, *i.e.*, during that portion of the year in which scarlatina is usually most prevalent and perhaps also most infective.

With respect to the possible influence of inefficient disinfection of the contents of invaded houses as a factor contributing to the re-invasion of such houses at a later date, even perhaps in some of those instances which are commonly ascribed to the return of patients from a hospital, it should be mentioned that a considerable improvement in the method of disinfection employed in the Bromley Urban District was effected towards the close of 1892. At that time an apparatus for disinfecting articles by super-heated steam was erected—a dry-heat chamber having been previously relied on—and it would appear that disinfection is now systematically and efficiently carried out in this district. Not only is the clothing worn by a patient at the time of his attack removed from the invaded dwelling by the Inspector of Nuisances for disinfection by super-heated steam, but all the patient's clothes, even those "worn long "before the case is discovered, and all articles which he has been or is

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* I am unable to include the Rural District in this comparison, as I have not received a complete list of the cases of scarlatina which occurred there in 1894.

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" likely to have been in contact with " are similarly dealt with. To the improved method of disinfection thus adopted, the Medical Officer of Health to the Bromley Urban District appeared disposed to attribute the comparative freedom of that District from " return cases " of scarlatina during the year 1893. And that the diminution of such cases may be attributable in part to better disinfection is likely enough, for instances have been met with elsewhere which afford strong grounds for the view that so-called "return cases" are sometimes due, not to any infectiousness of the persons returning from hospital, but to bringing again into use imperfectly disinfected articles of clothing, &c., infected by the patient before his removal to hospital, and stored away in drawers until required upon his return. But however this may have been in the particular cases in question, there can be no doubt that the Bromley Urban Authority acted wisely in providing an efficient disinfecting apparatus. At the same time the view that the comparative immunity of the Bromley Urban District from "return cases" in 1893, as compared with 1892, resulted from the improved method of disinfection *alone*, is difficult to reconcile with the considerable dimiuution of such cases which occurred concurrently in the other Constituent Districts, as to which no corresponding amendment in disinfection proceedings had been effected.

As regards disinfection in the Beckenham Urban District, washable articles are " disinfected " by the householders with a solution of carbolic acid (the carbolic acid " Calverts, No. 5," being supplied to them by the Urban Authority), and articles which will not bear washing are " disinfected " by the Inspector of Nuisances with sulphurous acid gas in the room recently occupied by the patient; there being no disinfecting apparatus in the district. The Inspector of Nuisances, however, is given a free hand as regard the destruction of infected clothing, the Authority paying compensation; and it appears that he largely avails himself of his powers in this respect. But it is evident that the arrangements for disinfection in the Beckenham Urban District cannot be regarded as satisfactory. It is impossible to feel much confidence in the efficiency of the disinfection of washable articles as carried out by the householders; and sulphur fumigation cannot, of course, be relied on. Even assuming that some destruction of clothing is resorted to in the case of every invaded household, the cost of compensation would naturally tend to limitation of the number of articles destroyed in each case, whereas if an efficient disinfecting apparatus were available, no equivalent question of cost would stand in the way of the wholesale and thorough disinfection of the patient's belongings.

In the Bromley Rural District fumigation with sulphurous acid gas is also depended on for the disinfection of such articles as will not bear washing (bedding, &c.).

With regard to the question of overcrowding of the hospital, I find that if occasion arises, as was the case during the recent epidemic, and especially towards the end of 1892, the acute wards are made to accommodate twice the number of patients for which they were designed; and it may, of course, be asked whether such a proceeding is likely to add to or prolong the infectiousness of convalescing patients. If the patients were discharged direct from these wards it would not be unreasonable, as it seems to me, to anticipate that the chances of infection being carried by such patients on leaving the hospital would be distinctly increased by any overcrowding of these wards. Not only would there be more likelihood of infection being carried in the hair, especially of female patients; but if it is true, as has been suggested, that practically all patients who have resided some time in an infected atmosphere, must upon leaving such atmosphere, be regarded as to some extent infectious, for a certain period, by reason of the infected air retained within their lungs, the danger from this cause would obviously increase with greater abundance of infective material in the atmosphere of the ward wherein they had been retained. As regards the Bromley and Beckenham Joint Hospital, however, this danger, if danger it really is, must have been considerably diminished by the fact of the patients being transferred from the fever wards to the entirely separate convalescent block a fortnight before their discharge from hospital.

Even under these circumstances, however, overcrowding of the hospital should of course be avoided; and it seems not impossible that such overcrowding may, in some rare instances, lead to re-infection and consequent renewal of actual infectiousness of patients of special susceptibility.

From what has been said in the foregoing Report it will be evident I think that the considerations involved in satisfactory explanation of so-called "return cases" of scarlatina are both many and complex. And the subject appears to be deserving of precise study elsewhere as opportunity offers. In regard to the present case, however, I should be disposed to summarise the results of information set out above as follows:—

During the period under review, but mainly during the year 1892, fresh cases of scarlatina occurred with exceptional frequency in households within the Constituent Districts shortly after the return to them of patients from the Bromley and Beckenham Joint Hospital. That a study of the behaviour of scarlatina in the Districts in question indicates, however, that the class of households from which the hospital patients were drawn, suffered, especially in 1892, from secondary invasion, apart altogether from any influence of hospital operations, in considerable excess as compared with the class in which home isolation was resorted to. That the cause or causes which gave rise to this excessive incidence, upon the "hospital isolation" class of households, of secondary invasion at dates which exonerate the hospital from any share in its production, may reasonably be thought of as having in all probability given rise also to some uncertain proportion of the secondary invasions of households of this class after the return to them of patients from the hospital; and that therefore the relation of some of such re-invasions to the return of the patients from the hospital may have been merely a *post hoc* and not a *propter hoc* relation.

On the other hand, however, the number of instances in which, among the cases in question, scarlatina re-appeared in households *shortly* after the return of such patients—the households having meantime remained free from fever—is such as to give strong grounds for the view that as regards some, and perhaps not a few, of the cases in question, the relation between the two facts was a relation of effect to cause. And this inference is rendered the more probable from the circumstance that some of the patients who had thus recently returned from hospital were, upon medical examination after the occurrence of fresh cases of fever in their respective households, found to be suffering from discharge from the nose, or, as in one case, from sore throat, and that not a few of them were still desquamating—though it seems quite possible that the so-called desquamation may in some instances have resulted from the free use of carbolic oil applications while in hospital.

As to what proportion of these secondary invasions was actually due to the return of patients from hospital, it appears to me impossible to say, and it seems also impossible to say definitely to what extent, if at all, such secondary invasions should be attributed to defective hospital administration. The scheme of precautions laid down for adoption at the Bromley and Beckenham Joint Hospital would certainly not seem to fall short of that in operation at similar hospitals elsewhere, though much would of course depend upon the practical efficiency with which such precautions were carried out. As to the efficiency and thoroughness of the Medical Superintendent's examination of the patients in question prior to their discharge from hospital it is impossible for me to speak. That officer, however, appears to have been fully conscious of the need for caution in the matter, and desirous of doing all in his power to prevent the conveyance of infection by patients leaving the hospital; if at least one may judge from the system of precautionary measures he describes as having been carried out there for several years past, and from the pains he has taken by consultation with Medical Superintendents of other Fever Hospitals to acquaint himself with the practice adopted elsewhere. And, if such is the case, it would hardly seem likely that he would have omitted the obvious and essential precaution of adequate examination of patients before their discharge. In this connexion, however, it is right to call attention to the return put in by the Clerk to the Beckenham Urban Authority (Addendum B.) and to the diagram (Addendum E.) which he has recently forwarded to me; both of which have been constructed with the view of showing a relationship to have subsisted between the daily time per patient spent by the Medical Superintendent at the hospital, and the occurrence of so-called "return cases." To this point, as well as to the increase in the average period of detention of patients in hospital during certain quarters of 1893 and 1894, as shown in the diagram, the Clerk to the Beckenham Authority attaches considerable importance, suggesting, as I understood him, that the greater caution of the Medical Superintendent in these respects during the first half of 1893, and, as he regards it, the *consequent* absence of "return cases" during that period, resulted from the inquiry into the matter held by the Joint Hospital Board early in that year. Similarly, at the final conference on January 21st, 1895, he pointed out that, with one exception, no "return cases" had occurred in his District during the year 1894; a fact which he attributed to the effect of the conferences held in January and February of that year.

The following considerations should, however, it seems to me, be taken into account in the interpretation of the diagram in question:—

1. That the period of immunity from "return cases" which followed upon the inquiry by the Joint Hospital Board, in January 1893, comprised that portion of the year (the first half) in which scarlet fever usually displays least tendency to extend itself.
2. That the diminution in the "return cases" in the autumn of 1893, as compared with the autumn of 1892, and the absence of any such cases in the autumn of 1894, may have had relation to differences at one and another time in the infectiousness of the disease parallel with the progress of the epidemic.
3. That the quarters of the year in which the average attendance of the Medical Superintendent at the hospital, expressed as *time per patient*, was at its lowest, were mostly those quarters in which

the average number of patients in hospital was highest. And in this connexion it has to be remembered that an increase in the total patients in hospital means beside an increase in the number of acute cases, and in the number of patients to be discharged, increase also in the number of convalescents remaining in hospital. Now, although it is no doubt true that an increase in the number of acute cases and of patients to be discharged, would, speaking generally, make an increasing demand, in arithmetical ratio, on the time of the Medical Superintendent, it is not clear that such holds good with regard to the increase in convalescents—persons who may be presumed to require little medical attention during the last few weeks of their stay in hospital, beyond the needful examinations from time to time as to the absence of complications and the progress of desquamation. Neither is it clear that the demand upon the time of the Medical Superintendent by administrative duties of a general sort increases in arithmetical proportion to the number of patients in hospital.

In conclusion it must be hoped that by scrupulous and sustained care on the part of the Medical Superintendent, with a somewhat fuller appreciation by the Beckenham Urban Authority of the difficulties of his office, as well as of the complexity of the problems concerned when explanation is sought of so-called "return cases" of scarlatina, the future career of the Joint Hospital may be one of complete and fully recognised usefulness.

It appears to me, however, important that overcrowding of the hospital should at all times be carefully guarded against; further accommodation being provided if needful to secure that end. And in view of the possibility of some proportion of so-called "return cases" having been due to the renewed use by patients on their return home of some infected article of clothing stored away during their absence in hospital, the Beckenham Urban and Bromley Rural District Councils would act wisely in perfecting their arrangements for disinfection.

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ADDENDUM A.

Mr. Stevens's List of "Return Cases" of Scarlatina in the Beckenham Urban District.

Name.	Date of Removal.	Return.	Persons infected by Returned Patients.	
			Name.	Date of Notification.
	1892.	1892.		1892.
*[G. B. W.	18th March	14th May	V. W.	22nd May.]
B. T.	16th August	12th October	G. T.	16th October.
			E. G.	17th „
F. T.	9th September	3rd November	B. T.	21st November.
			Et. T.	24th „
E. M. T.	17th „	23rd „	Ed. T.	28th „
W. G. R.	18th October	23rd December	A. R.	31st December.
G. G.	21st „	17th „	I. G.	26th „
				1893.
			D. G.	6th January.
			E. G.	7th „
A——e. P.	27th „	24th „	A——r. P.	6th „
			J. P.	9th „
			F. P.	17th „
	1893.	1893.		
W. B.	17th May	8th July	M. B.	13th July.
			H. B.	15th „
			E. B.	22nd „
			D. B.	22nd „
V——t. R.	7th June	2nd September	V——r. R.	8th September.
A. C.	2nd July	2nd „	H. C.	16th „
W——r. H.	18th „	2nd „	F. H.	11th „
			W——d. H.	20th „

* [Though this list includes eleven so-called "return cases," Mr. Stevens was content, as I understand him, to rely mainly upon the ten cases commencing with B. T. Certain facts as to the earlier case of G. B. W. are, however, given on page of this Report.—T. W. T.]

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ADDENDUM B.

Comprising certain RETURNS with reference to the FIVE QUARTERS ending DECEMBER 1893, put in by Mr. STEVENS, Clerk to the BECKENHAM URBAN AUTHORITY, at the CONFERENCE on FEBRUARY 12th, 1894.*

BROMLEY AND BECKENHAM JOINT HOSPITAL.

PARTICULARS as to PATIENTS for QUARTER ending 31st DECEMBER 1892.

Week ending	Average Daily Attendance of Medical Superintendent.	Total Number of Cases in Hospital.	Bromley Urban.		Beckenham Urban.		Bromley Rural.	
			Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.
1892.	Minutes.							
8th Oct. -	26	66	9	1	27	1	30	7 *a*
15th „ -	24	65	10	—	26	1 *b*	29	6
22nd „ -	32	70	12	2 *c*	31	2	27	3
29th „ -	30	71	11	2 *c*	32	4	28	—
5th Nov. -	42	77	10	—	32	8 *d*	35	7 *e*
12th „ -	54	73	10	—	28	5	35	1
19th „ -	37	69	10	1	23	6	36	2
26th „ -	28	68	10	—	23	2 *f*	35	4
3rd Dec. -	30	68	11	3 *g*	23	—	34	—
10th „ -	69	69	11	3 (1 death).	24	2	34	1 *h*
17th „ -	56	65	7	—	23	4 *i*	35	1 (1 death).
24th „ -	66	65	10	2	20	4 *j k*	35	14 *l m n*
31st „ -	24	50	11	1 *p*	17	4	22	4

a. A. W. B. discharged 25th October, E. B. admitted at hospital on 31st October.

b. B. T. discharged 12th October, G. T. admitted on 16th October, and E. G. on 17th October.

c. Three B——'s discharged 22nd, 24th, 26th October. Two B——'s admitted on 24th and 27th.

d. F. T. discharged 3rd November, B. T. admitted on 21st November, and E. on 24th November. Doctor's attendance at hospital, 1st November, 50 minutes; 2nd, 40 minutes; 3rd, 20 minutes.

e. Two B——'s discharged 31st October, W. B. admitted 15th November.

f. E. M. T. discharged 23rd November, E. T. admitted 28th November. Doctor's attendance at hospital, 20th November, 10 minutes; 21st, 15; 22nd, 20; 23rd, 40.

g. Two T——'s discharged 28th, 30th November, F. admitted 20th December. A. R. T. discharged 3rd December, L. R. admitted 15th December.

h. A. P. discharged 5th December, E. P. admitted on 12th December.

i. G. G. discharged 17th December, I. G. failed 26th December, D. G. 6th January, and E. G. on 7th January.

j. On 23rd W. R. discharged; on 31st A. R. failed.

k. On 24th A. P. discharged; on 6th, 9th, 17th January three P——'s failed.

l. On 20th C. S. discharged; on 2nd January two S——'s admitted.

m. On 20th W. H. G. discharged; on 29th December and 17th January two G——'s admitted.

n. On 21st J. B. discharged; on 6th January E. B. admitted.

p. On 27th A. T. B. discharged; on 12th January two B——'s admitted.

Doctor's attendance at Hospital: Average for the quarter, per patient per day, ·59 minute; per patient per week, 4·1 minutes.

Sixteen return cases in quarter.

Inquiry held by Hospital Board on 20th January 1893. Three doctors testified that E. M. T.'s case peeling after discharge.

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* [It should be mentioned that the Return for the December Quarter of 1893 gives two "return cases," one in the Bromley Urban and one in the Bromley Rural District, which are not shown in Table B (2) of my Report as they are not found in the lists supplied to me by the Officers of the Districts in question.—T. W. T.]

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Bromley and Beckenham Joint Hospital.

Particulars as to Patients for Quarter ending 1st April 1893.

Week ending	Average Daily Attendance of Medical Superintendent.	Total Number of Cases in Hospital.	Bromley Urban.		Beckenham Urban.		Bromley Rural.	
			Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.
1893.	Minutes.							
7th Jan. -	46	48	11	1 (death).	14	3	23	5
14th „ -	41	56	21	2 (deaths).	16	1	19	—
21st „ -	61	59	21	—	18	—	20	1
28th „ -	82	62	22	1 (death).	19	4 (1 death).	21	5 (1 death)
4th Feb. -	56	55	22	2	17	—	16	4
11th „ -	44	40	20	1	18	1	11	3
18th „ -	39	47	21	2	17	1	9	2
25th „ -	35	43	19	1	17	1	7	2
4th March	45	42	20	1	17	4	5	—
11th „ -	30	41	22	—	13	2	6	3
18th „ -	46	39	23	5	13	1	3	1
25th „ -	63	38	18	6	18	3	2	1
1st April -	44	33	12	3	18	2	3	1 (death).

Doctor's attendance at Hospital: Average for the quarter, per patient per day, 1·03 minutes; per patient per week, 7·23 minutes.

No return cases this quarter.

Bromley and Beckenham Joint Hospital.

Particulars as to Patients for Quarter ending 1st July 1893.

Week ending	Average Daily Attendance of Medical Superintendent.	Total Number of Cases in Hospital.	Bromley Urban.		Beckenham Urban.		Bromley Rural.	
			Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.
1893.	Minutes.							
8th April -	53	30	9	1	19	4 (1 death).	2	—
15th „ -	34	31	10	—	19	—	2	—
22nd „ -	55	42	13	—	26	1	3	2
29th „ -	47	47	15	1	29	1	3	—
6th May -	61	52	18	6 (2 deaths)	30	4	4	—
13th „ -	48	46	12	—	27	2	7	—
20th „ -	37	46	12	—	26	—	8	2
27th „ -	44	46	14	2	26	4 (1 death).	6	—
3rd June -	52	46	13	5	24	1	9	—
10th „ -	41	42	9	—	23	4	10	—
17th „ -	38	45	11	—	23	2	11	—
24th „ -	56	52	11	2	25	3	16	1
1st July -	72	49	8	1	25	5	16	2

Doctor's attendance at Hospital: Average for the quarter, per patient per day, 1·12 minutes; per patient per week, 7·85 minutes.

No return cases this quarter.

App. A. No. 9.

On "Return" Cases of Scarlatina; by Mr. T. W. Thompson.

BROMLEY AND BECKENHAM JOINT HOSPITAL.

PARTICULARS as to PATIENTS for QUARTER ending 30th SEPTEMBER 1893.

Week ending	Average Daily Attendance of Medical Superintendent.	Total Number of Cases in Hospital.	Bromley Urban.		Beckenham Urban.		Bromley Rural.	
			Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.
1893.	Minutes.							
8th July -	67	48	10	—	24	*a* 1 (1 death).	14	1
15th „ -	49	50	11	1	25	3	14	2
22nd „ -	43	56	16	—	27	1 (death).	13	2
29th „ -	49	65	17	2	31	4 (1 death).	17	1
5th Aug. -	47	65	18	4	27	1	20	3
12th „ -	52	56	14	1	25	2	17	1
19th „ -	48	55	13	—	26	6	16	—
26th „ -	36	49	13	1	20	3	16	1
2nd Sept. -	39	47	12	—	20	6 *bcd*	15	—
9th „ -	42	47	15	5 *a*¹	16	2	16	2
16th „ -	27	44	10	—	18	—	16	—
23rd „ -	35	50	10	—	21	—	19	—
30th „ -	58	56	14	2	22	1	20	—

a. W. B. discharged 8th July 1893, Four B——s failed on 13th, 15th, 22nd, and 22nd of same month.

*a*¹. On the 9th September, A. R. discharged, on 26th September, A. R. admitted.

b. V——t R. discharged 2nd September 1893, on 8th September V——r R. failed.

c. A. C. discharged on 2nd September, H. C. failed on 16th October.

d. On 2nd September, W. H. discharged, on the 11th and 20th September, F. H. and W. H. respectively failed.

Doctor's attendance at Hospital: Average for the quarter, per patient per day, ·87 minute; per patient per week, 6·06 minutes.

Five return cases in quarter.

BROMLEY AND BECKENHAM JOINT HOSPITAL.

PARTICULARS as to PATIENTS for QUARTER ending 31st DECEMBER 1893.

Week ending	Average Daily Attendance of Medical Superintendent.	Total Number of Cases in Hospital.	Bromley Urban.		Beckenham Urban.		Bromley Rural.	
			Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.	Patients in Hospital.	Patients discharged.
1893.	Minutes.							
7th Oct. -	51	60	13	2	23	2	24	1
14th „ -	51	66	16	1	25	3	25	1
21st „ -	42	67	16	1	25	2	26	4 (death).
28th „ -	55	66	17	2	24	3 (1 death).	25	7
4th Nov. -	25	57	17	4	21	3	19	2
11th „ -	44	54	15	—	20	4	19	1
18th „ -	39	51	16	6 *a*	17	2	18	2
25th „ -	28	47	15	1	14	1	18	1
2nd Dec. -	27	45	15	3	13	3	17	2 *b*
9th „ -	41	43	16	3	12	1	15	3
16th „ -	42	46	15	1	12	1	19	1
23rd „ -	48	51	19	1	11	7	21	3 *c*
30th „ -	63	48	23	—	5	—	20	5 (3 deaths).

a. On 18th November, F. A. S. discharged, on 22nd November, F. A. S. admitted.

b. On 16th December, R. W. discharged, on 22nd December, C. W. admitted.

c. On 21st December, two A——s discharged, on 4th January, H. A. admitted.

Doctor's attendance at Hospital: Average for the quarter, per patient per day, ·79 minute; per patient per week, 5·58 minutes.

Three return cases this quarter. Neither from Beckenham. (Letter *re* A. C——'s case early in quarter.)

App. A. No.

On "Return" Cases of Scarlatina; by Mr. T. W. Thompson.

ADDENDUM C.

Comprising Correspondence and Medical Certificates with reference to the Case of the Children P——r; supplied by the Officers of the Beckenham Urban District Council and of the Joint Hospital Board.

The Stables, B——,
B——,* 4th May 1894.

Dear Sir,

You will remember taking two children with fever from the Stables, at Dr. K——s, K—— P——, Beckenham, 10 weeks ago to-morrow. I had a notice to fetch them last Saturday, which I did. The matron asked me to examine them, which I did, telling her at the same time that I was no authority on the matter, though I was very pleased with the children's appearance, both looking fat and well; that was last Saturday. I brought them straight here, with the result that our eldest girl failed with scarlatina last Wednesday; Condy's Fluid had been freely used, according to the hospital directions. We have been here six weeks, but it looks suspicious. She has had a separate sleeping room, separate towel, flannel, &c. Nothing in common with the two children. You know you destroyed the clothes that the children had worn, everything for them was fresh, that we cannot understand it. The boy had a stuffiness in his head, but no discharge anywhere. The hospital authorities took our girl away yesterday, and of course asked if we had had it before. Our people are terribly annoyed about it. It has been had down here. You adopt greater precautions than they do here. I am sorry to say we are liable to pay 1*l*. per week, of course we cannot do that. The more we think about it the more we are bewildered.

I remain, &c.
(Signed) E. P.

Medical Officer of Health Department [B——].
May 7th, 1894.

Dear Sir,

In reply to your letter of the 5th I beg to inform you that I have visited Mrs. P.'s family this day, and made a personal examination of the two children. In the case of the little boy, R. P., aged five, I find that there is a considerable quantity of fine peeling on the arms and sides. The little girl is, as far as I can see, quite free from any roughness or peeling. There has been no possible source of infection at the house where the parents are living, and I can (under the circumstances) come to no other opinion than that the elder sister, lately removed to our hospital, caught the complaint from her brother R.

I am, &c.
(Signed) P. W. G. N.

F. Stevens, Esq.

To the Beckenham Local Board.

Dear Sirs,

At your request, conveyed by the Medical Officer of Health for B——, I have, this 9th day of May 1894, seen and examined F. P., aged seven, and R. P., aged five, children of J. P., now at R—— Stables, G—— Road, B——.

F. is scaling in her arms and inside of legs, and R. in his outside of legs and arms, and other parts of the body. I consider that this desquamation indicates that they are both in an infectious condition, the scaling commencing in each case after an attack of scarlet fever.

I am, &c.
(Signed) G. S., M.D.,
M.R.C.S., L.R.C.P., D.P.H. London.

9th May 1894.

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* Throughout this correspondence B—— stands for the borough in the South of England referred to on page 107.

To the Beckenham Local Board.

App. A. No. 9.

On "Return" Cases of Scarlatina; by Mr. T. W. Thompson.

GENTLEMEN,

AT your request, conveyed to me by the Medical Officer of Health for B——, I have this day examined F. P., aged seven, and R. P., aged five, children of J. P., at present residing at R—— Stables, The G——, B——, and certify that I found their skin scaling on the arms, legs, and body, probably the result of having had scarlet fever, and that they are therefore still in an infectious condition.

(Signed) A. H. V., F.R.C.S., L.R.C.P.,
May 9th, 1894. B——.

SIR, Local Board Office, 10th May 1894.

I BEG to report that on the 17th February last, F. P., seven, and R., five, failed with scarlet fever, at Dr. K.'s Stables, K—— P——, and on the same day were removed to the hospital; they only had on their night-dresses.

Immediately after their removal I and my assistant disinfected the rooms. The clothing that the children had worn previous to removal being put in the room whilst under disinfection. The room was sealed up from 8 p.m. on Saturday night until 10 a.m. Monday morning, when my assistant burnt the unwashable clothes that had been worn by the children, and for which compensation was given.

All other washable articles in the room were boiled, and the rooms thoroughly cleansed with carbolic acid and soap.

I am, &c.
F. Stevens, Esq. (Signed) G. ROOTS, Sanitary Inspector.

DEAR SIR, B——, 11th May 1894.

I HEREWITH enclose memo. of receipt of fees, for which I am obliged. In my first visit to these children the fact that the girl was in an infectious condition was not well-marked, but at my subsequent visit with the other two medicos the fact that she was still desquamating was very obvious, and on these grounds I must agree with them that she, as well as her brother, was still in an infectious condition.

I am, &c.
F. Stevens, Esq., (Signed) P. W. G. N.
Beckenham Local Board.

The Stables, R——, G—— Road,
SIR, B——, May 12th, 1894.

YOUR letter received this morning. What clothes the children possess now were got down here, nothing whatever belonging to them was brought from Beckenham. The children were examined by Dr. N. last Monday, and declared to be infectious. The boy was scaling very much. Two other doctors examined them the following Wednesday, and pronounced them to be in a very infectious state. The reason I wrote to you was I thought you ought to know, as you took so much trouble in every way with the disinfecting business, and as the children are declared to be infectious now that is proof positive where the other child got it from. The hospital committee [at B——] say we are to pay 4*s.* per week, 3*s.* 6*d.* for ambulance, 1*l.* for disinfecting room, bedding, &c., and the remaining three rooms to be disinfected when the children are declared free from contagion. We are to find the girl clothes while she is in the hospital, all of which will be destroyed when she leaves. Surely the board will not expect us to bear the expense, for we certainly cannot do that, to say nothing of the inconvenience it has put my husband to. He has to be away from us and manage as best he can. We have been isolated from everyone since last Monday, and must continue so till Dr. N. sees them in the course of another week. I will say the children came home looking the picture of health. Our quarters here are furnished, so we brought nothing but our clothes. It is very annoying for everyone concerned in our affair. I shall ever remember coming to B——.

I remain, &c.

To Mr. W. Roots. (Signed) E. P.

"F. and R. P."

Crofton, Orpington, Kent,
May 8th, 1894.

DEAR SIR,

REGARDING the above patients, I beg to state that they were in the hospital 10 weeks. Before leaving the hospital each patient had for several weeks one daily bath. All peeling had quite finished, and at no time did either patient suffer from any discharge. On several occasions I examined these patients, and the final examination was very thorough, and was performed (on April 26th) not only by myself but by Dr. Yolland. I was unable to be present at the actual departure of the patients, as they left the hospital at an unusually early hour, but the matron, who was present, testifies to the absolutely perfect condition of each child. The mother gave us the usual certificate which we obtain on these occasions, and has since written to the matron stating that the children were quite well and free from all discharge.

I remain, &c.

R. G. Mullen, Esq., (Signed) R. ALEX. SHANNON.
Clerk to the Bromley and Beckenham Joint Hospital Board.

Re F. and R. P.

Crofton, Orpington, Kent.
May 16th, 1894.

DEAR MR. MULLEN,

I ENCLOSE a certificate from an experienced and eminent medical man in B——, Dr. W.

Dr. W. states in this certificate that he "finds no trace of any "desquamation on any part of their bodies, and there is no discharge "from the nose or ears of either child."

Dr. W. informs me by letter that he visited these patients *twice*, and examined them with a *lens*.

I remain, &c.

R. G. Mullen, Esq., (Signed) R. ALEX. SHANNON.
Clerk to the Bromley and Beckenham Joint Hospital Board.

THIS is to certify that I have this day examined F. and R. P., and find no trace of desquamation on any part of their bodies, and there is no discharge from the nose or ears of either child.

(Signed) G. W., M.R.C.P.I., M.R.C.S., &c.

B——, May 14th, 1894.

Re "Children P."

Crofton, Orpington, Kent,
May 21st, 1894.

DEAR SIR,

A FEW days ago I posted to you my own statement regarding the above children, and enclosed a certificate from Dr. W. of B——. I now enclose a further certificate from Dr. Yolland. I wrote to Dr. N., the Medical Officer of Health for B——, asking him some questions, and

App. A. No. 9.

On "Return" Cases of Scarlatina; by Mr. T. W. Thompson.

pointed out that at one time he said one of the children was not peeling, and at another that she was peeling; and I enclose a copy of the letter I received in reply, which contains some rather noteworthy remarks. I have now nothing further to add, but if you should think it necessary for me to attend the next board meeting kindly let me know.

I remain, &c.

R. G. Mullen, Esq., (Signed) R. Alex. Shannon.
Clerk to the Bromley and Beckenham Joint Hospital Board.

This is to certify that on the morning of Thursday, April 26th, 1894, at the Infectious Hospital, Bromley Common, I most carefully examined F. and R. P. (who were both naked), and that I could find no trace of desquamation, nor had they either an aural or nasal discharge, and that, so far as I could tell, they were quite free from the infection of scarlet fever, and fit to be discharged from the hospital.

(Signed) J. H Yolland, M.R.C.S. England.

May 19th, 1894.

Re P. Children.

Dear Sir, B——, May 19th, 1894.

I do not think the hardness of your water will account for the renewed peeling of the skin in the case of the above children. You must remember that most waters lose their hardness after boiling, and I presume these children were washed in hot water. A too strong carbolic acid soap will undoubtedly cause a roughness of the skin—this fact must be patent to many surgeons who are in the habit of washing in carbolic acid. The fine peeling on the body of these children may have been caused in this way? I agree in the main with the authorities who say that the hands and feet are the last parts to peel; this, in an extensive experience of many years, accords with my own; but I would say that body peeling may take place a second time, ah, and even a third time. Ninety per cent. of cases are generally free from infection at the end of the seventh week, but there are other cases I cannot but suppose must be infectious for a longer period, and in every case that continues to peel we must be compelled to suppose it still infectious. Some cases may be quite free from peeling when they leave an isolation hospital, but a fresh peeling will show itself after their return home. In respect to the little girl, at my first visit she did not appear to be peeling, although I looked carefully at her with a magnifying glass, but on a subsequent visit, about six days later, I noticed undoubted desquamation, and I was obliged to concur in the opinion of the other doctors. In answer to your last question, I must admit that the peeling in these two cases did not differ from that which occurs in very mild cases of scarlet fever.

I remain, &c.

Dr. R. A. Shannon. (Signed) P. W. G. N., M.O.H.

ADDENDUM D.

Form No. 1.

BROMLEY AND BECKENHAM JOINT HOSPITAL.

This Patient will be kept in the Hospital for at least eight weeks.

At the time of discharge, everything will be done to render disinfection thorough and complete; but, with a view to avoiding all risk, it is desirable that the Patient, after leaving the Hospital, should be sent for about a fortnight to a Convalescent Home or other place where there are no children or persons likely to take infection.

Form No. 2.

BROMLEY AND BECKENHAM JOINT HOSPITAL.

____

____

Will be ready to leave this hospital on next, at o'clock.

Any article of Clothing worn by the Patient on admission will be destroyed.

____________________ Matron.

Form No. 3.

BROMLEY COMMON ISOLATION HOSPITAL.

____

I this day remove , who appears to me to be in good health and free from all eruption or discharge.

Also I have examined the face, head, neck, chest, hands, arms, legs, and feet, and see no traces of scales or skin coming off.

(The Medical Superintendent has examined this Patient in my presence.)(¹)

Signed ____________________

(¹) Added since the conference in Feb. 1894.

Form No. 4.

BROMLEY AND BECKENHAM JOINT HOSPITAL BOARD.

Instructions to Patients.

It is particularly requested that this patient be kept apart from other persons, and that no embracing, kissing, or sleeping together be permitted.

It is also particularly requested that this patient's throat be gargled twice daily with a solution of Condy's Fluid and warm water, and that the nose and ears be sponged twice daily with the same solution.

R. GORDON MULLEN,
Clerk to the Board.

Local Offices, Bromley, Kent,
7th March 1890.

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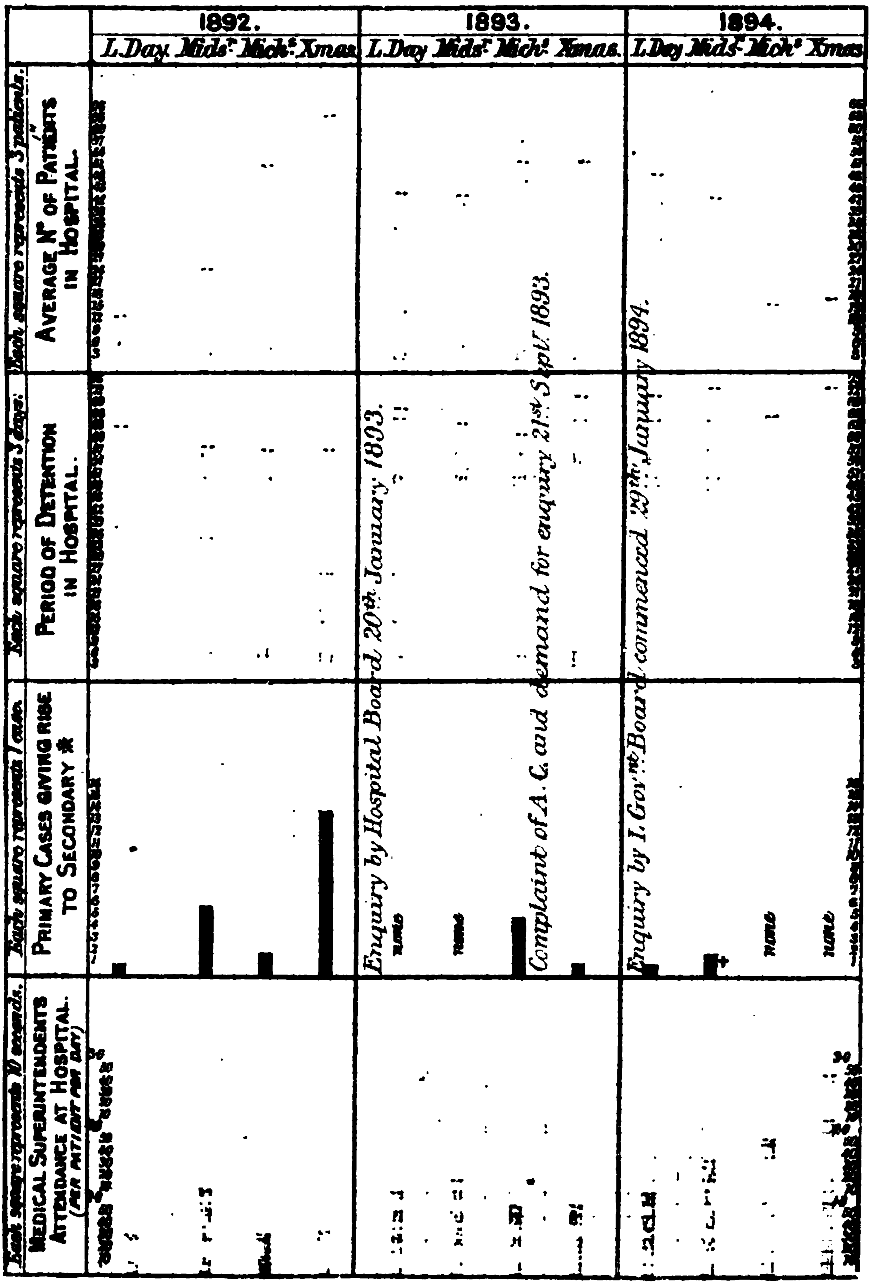
Appendix E.

BROMLEY & BECKENHAM JOINT HOSPITAL.

Diagram - shewing Primary Cases of Scarlet Fever giving rise to Secondaries and other particulars in connection herewith.



*The Secondary Cases here referred to are presumably such as the Clerk to the Beckenham District Council regards as due to the return of patients from Hospital. T. W. T.

+The information recently supplied to me in reference to 1894 by the Officers of the Three Constituent Districts contains no mention of these two cases. T. W. T.

Beckenham U.D. Coun

No. 10.

REPORT upon MEASLES in ENGLAND and WALES, and as to MEASURES that may be and which have been adopted by SANITARY AUTHORITIES with a view to obtaining control over this Disease; by DR. THEODORE THOMSON.

APP. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

PART I.—INTRODUCTORY.

In recent years questions have been arising as to what measures may be likely to be useful to Sanitary Authorities in obtaining control over measles. The interest thus evinced concerning prevention of this disease has resulted from the large share that measles has for some time been contributing to the mortality from zymotic disease, and especially from the fact that, while the mortality rates of other zymotic maladies have in most instances been decreasing, the general tendency of the mortality rate of measles has, except in very recent years, been rather towards increase than toward diminution. The following table (Table I.), based on data furnished in the Reports of the Registrar-General, affords means of comparing, as regards mortality rates, the seven principal zymotic diseases during groups of years from 1851 to 1894:—

TABLE I.

SHOWING for ENGLAND and WALES the ANNUAL RATES of MORTALITY per 1,000 Persons living at all Ages, in Groups of Years from 1851 to 1894, from seven Zymotic Diseases.

——	1851-60.	1861–70.	1871–80.	1881–90.	1891–94.
Small-pox - -	0·22	0·16	0·28	0·04	0·02
Measles - -	0·41	0·44	0·38	0·44	0·41
Scarlet fever - -	0·88	0·97	0·72	0·33	0·19
Diphtheria - -	0·11	0·18	0·12	0·16	0·25
Whooping cough -	0·50	0·53	0·51	0·45	0·41
"Fever" - -	0·91	0·88	0·48	0·23	0·18
Diarrhœa - -	1·08	1·08	0·93	0·67	0·57

From this table it appears that in the decade 1881–90 only two diseases of the zymotic class—diarrhœa and whooping cough—showed higher death-rates than measles; and, indeed, the whooping cough death-rate is seen to be very little greater than that of measles. As matter of fact, in the latter half of the 1881–90 decade, the death-rate from measles exceeded that caused by whooping cough; for in the five-year period 1886–90 the death-rate from measles was 0·47 per 1,000 living, while that due to whooping cough was 0·46. In the 1891–94 period the measles and whooping cough death-rates are seen to be the same, and are surpassed only by the diarrhœa death-rate. It appears also from the table that the only diseases of the zymotic class that show no decline in mortality during the periods 1881–90 and 1891–94, as compared with three decades prior to 1881, are measles and diphtheria; the mortality from measles during the periods 1881–90 and 1891–94 being greater than in 1871–80, and much the same as in the decades 1851–60 and 1861–70.

The death-rate from measles is not equally high throughout all parts of England and Wales. The mortality caused by this disease is considerably lower in rural districts than in towns, as is indicated in the following table (Table II.), taken from the Registrar-General's Supplement to his 55th Annual Report:—

TABLE II.

Showing, in the Form of Annual Rates per 1,000 living, for England and Wales, and for different Groupings of Districts in England and Wales, the Mortality from all Causes and from each of the principal Zymotic Diseases during the Ten Years 1881–90.

—	Mean Population.	Births.	Deaths from all Causes.	Under One Year.	Small-pox.	Measles.	Scarlet Fever.	Diphtheria.	Whooping Cough.	Fever.	Diarrhœa.
England and Wales - -	27,488,482	32·34	19·08	142	0·04	0·44	0·33	0·16	0·45	0·24	0·66
28 great towns - - - - -	8,758,162	34·00	21·51	168	0·09	0·63	0·40	0·19	0·61	0·26	0·89
50 other great towns - - -	2,784,019	33·65	19·73	153	0·03	0·50	0·39	0·10	0·42	0·27	0·73
78 towns - - - -	11,542,181	33·91	21·08	160	0·07	0·59	0·40	0·17	0·57	0·26	0·85
England and Wales less the 78 towns - - - - - -	15,946,301	31·20	17·63	128	0·02	0·33	0·29	0·16	0·37	0·22	0·52

From the data in this table it is evident that town districts suffer now from measles much more than do rural districts; the measles mortality in the 28 great towns, indeed, being nearly double that in "England and Wales less the 78 towns." This predilection for towns is by no means peculiar to measles; it is especially notable in the case of small-pox, and is conspicuous also, though to a less extent than with measles, in regard of certain other diseases of the zymotic class. This is no doubt attributable to the greater opportunities for intercommunication, and therefore for spread of infection, afforded by large and dense aggregations of people.

Measles in this country, notwithstanding that the interval between epidemics varies considerably in different localities, is essentially a disease of children. In the fifty-first Annual Report of the Registrar-General information is given as to the average annual death rate in England and Wales from measles, as well as from other diseases of the zymotic class, at several age-periods; and from this source I append the following data, making use of rates per 1,000 for purposes of comparison with other figures adduced in this report:—

Period taken for Calculation.	Total Number of Deaths from Measles in Period.	Number of Deaths from Measles under Five Years of Age in Period.	Rates annually.	
			Measles Death-rate per 1,000 at all Ages (based on the Registrar-General's figures for the Standard Million).	Measles Death-rate per 1,000 Living under Five Years of Age.
1848–87 -	Male - 187,338	Male - 172,567	Male - 0·43	Male - 2·89
	Female - 180,264	Female - 163,307	Female 0·41	Female - 2·74

It appears from these figures that the measles death-rate in England and Wales at ages under five was some seven times greater than that from the same cause at all ages during the period 1848–87. There were, in all, during these 40 years, 367,602 deaths attributed to measles, and 335,874 of these occurred among children of less than five years of age, leaving 31,728 only to be distributed among persons aged five years and upwards.

Further data from the Registrar-General's Report above referred to show the distribution of these 335,874 deaths among children aged under five, as follows:—

Under 1 year - M. 3·01 deaths annually per 1,000 living at that age.
F. 2·51 " " "
1–2 years - M. 5·81 " " "
F. 5·46 " " "
2–3 " - M. 2·88 " " "
F. 2·93 " " "
3–4 " - M. 1·60 " " "
F. 1·68 " " "
4–5 " - M. 0·93 " " "
F. 0·96 " " "

According to these data the age at which relatively the greatest number of children die of measles is the second year of life; while after the third year has passed there is rapid decrease in the proportion of children dying of this disease.

In one of the districts visited by me information for a limited period was available, not only as to the ages of persons who had died of measles, but also as to the ages of almost all those known to have been attacked by this disease. The statistics furnished to me on this latter point extend over a period of about two years, during which time notification of measles was compulsory in the district. Upon the data thus supplied to me is based the following table (Table III.), which affords means of contrasting the proportions of persons attacked by measles, as well as of deaths referred to measles, at several age periods, and also the proportions of deaths to attacks at these age-periods.

TABLE III.

Showing for a particular Urban District the Number of Persons known to have been attacked by Measles at each of several Age-periods, and also, in each instance, the Number of Deaths referred to this Disease during a period of about two years; with the Attack-rate and Death-rate annually from this cause per 1,000 living, and the Fatality-rate per 1,000 persons attacked by measles during the period.

Age Groups.	Estimated Mean Population, Mar. 1892–Mar. 1894.	Attacks by Measles, Mar. 1892–Feb. 1894.	Deaths from Measles, Mar. 1892–Mar. 1894.	Measles Attack-rate annually per 1,000 living.	Measles Death-rate annually per 1,000 living.	Measles Fatality-rate per 1,000 attacked.
At all ages -	35,606	2,031*	125	28	1·7	61
0–1 - -	1,155	166	16	72	6·9	96
1–2 -	974†	233	46	119	23·6	197
2–3 - -	1,028	354	36	172	17·5	102
3–4 -	1,000	324	16	162	8·0	49
4–5 - -	951	324	5	170	2·6	15
Under 5 -	5,108	1,401	119	137	11·6	85
5–10 -	4,530	560	6	62	0·7	11
10 and upwards -	25,968	39	0	0·75	0·0	0

* As regards 31 of these persons there is no knowledge as to age.

† Based upon the 1891 census figures. No doubt there has been confusion at the census between children under one year of age and children over one year of age.

The mortality from measles shown by this table is very much greater than that indicated by the figures quoted above on this subject from the returns of the Registrar-General; for the reason that measles was epidemic in the district to which Table III. refers during nearly the whole of the period dealt with in the table. If due allowance be made for this fact it will be observed that there is, as regards relative incidence of death from measles on certain age-groups, a general resemblance between the figures of the Registrar-General and those contained in Table III., notably in the marked incidence of mortality on children under five years of age, and especially on those in the second year of life.

But the incidence of *attack* as regards age is, it will be observed from the figures in Table III., different from that of *death*. For while the main incidence of death is on the second year, the incidence of attack is chiefly on the third, fourth, and fifth years of life. From this different incidence of attack and of death, it results that the *fatality* from measles is very much higher in the second year of life than in any of the three succeeding years: thus in the table the second year of life is credited with a fatality from measles nearly twice as great as that of any other age-period. While, therefore, more children die of measles in the second year of life than at any other age, more children are attacked by this disease in each of the three years following; so that children in the second year of life, although less susceptible to attack, are muchmore likely to die if attacked than are other children. The principal conclusions to which the figures of Table III. point are: (1) That measles attacks chiefly children in the third, fourth, and fifth years of life; (2) that the greatest mortality from measles occurs in the second year of life; and (3) that measles is pre-eminently fatal in the second, third, and first years of life.

I append also a table (Table IV.) showing what, in England and Wales, has been the incidence of mortality from each of the seven principal zymotic diseases, on children under five years of age, during the period 1851–90. From these figures it will be observed that the three diseases of the zymotic class, standing out in the last decade as causing exceptionally high mortality at these early ages, are diarrhœa, whooping cough, and measles.

TABLE IV.

ENGLAND and WALES: ANNUAL MORTALITY severally from SEVEN DISEASES of the ZYMOTIC CLASS, per 1,000 persons living at Ages under 5 years, in four Decennia.

——	1851–60.	1861–70.	1871–80.	1881–90.
Small-pox - - -	1·03	0·65	0·53	0·08
Measles - - -	2·80	3·00	2·57	3·13
Scarlet fever - -	4·19	4·62	3·49	1·67
Diphtheria - -	0·43	0·77	0·47	0·69
Whooping-cough - -	3·62	3·77	3·65	3·37
Fever - - -	1·42	1·25	0·65	0·19
Diarrhœa - - -	5·26	5·98	5·73	4·35

From the various data I have given it appears—

(1) that measles has in recent years been causing more deaths than small-pox, or scarlet fever, or diphtheria, or "fever";

(2) that measles has during the past four years proved as deadly as whooping cough, and that it even exceeded that disease in mortality during the five years 1886–90;

(3) that measles has shown increasing mortality since the decade 1871–80, whereas the mortality of all the other principal diseases of the zymotic class, with the exception of diphtheria, has decreased—in some instances very markedly—since that period; and

(4) that measles is a zymotic disease highly dangerous to very young children, especially to those attacked by it in the second year of life.

There is, therefore, good reason why Sanitary Authorities should bestir themselves to deal with a disease which causes a mortality so serious. And it is worthy of consideration by these authorities that mere discouragement of measles to the extent of lengthening the inter-epidemic periods of the malady must materially reduce the death-rate from this cause, inasmuch as in this way a larger number of the population will have been enabled in the interval to pass in safety that year of life at which the disease has hitherto caused the greatest mortality.

It has, however, been contended that measles is a malady the spread of which it is peculiarly difficult to control; the chief contentions in this connection being as follows:—

(a.) That Sanitary Authorities are apt to remain ignorant of the presence of measles in their districts by reason of the slight regard in which this disease is held by the public. As a consequence the householder does not, it is said, deem it necessary to acquaint the Sanitary Authority of invasion of his dwelling by measles; and frequently, so little heed is paid to this malady, the householder does not call in a medical attendant for the sick children: So that in those localities where trial has been made of compulsory notification of measles, no report reaches the authority from either medical attendant or householder in a considerable per-centage of cases.

(b.) That measles is a malady which is highly infectious for two or three days before diagnosis of the real nature of the disease is practicable; and that, accordingly, during this period its infection is frequently disseminated prior to declaration of the ailment being measles.

(c.) That owing to the apathy of the public as regards measles it is exceptionally difficult to procure a sufficient measure of isolation of the sick in their homes; and that, on the other hand, removal of all imperfectly isolated measles cases to hospital during an epidemic of that disease would necessitate an extravagant amount of hospital accommodation.

In view of these facts and considerations, I was, on July 7th, 1891, instructed by the Board to make inquiry as to measures that might be expected to afford means of control of measles, and to this end to visit certain districts that might be thought of as likely to furnish particular information on this subject. Inquiry was commenced by me in accordance with these instructions during the autumn of 1891, and a preliminary report was made by me to the Board in December of that year. In July of the year following I was further instructed to visit certain additional districts, from which it was anticipated that useful knowledge would be obtained as to the subject of this inquiry. Owing to pressure of other duties, however, I was unable to resume the inquiry until the winter of 1892: while in 1893 my investigations respecting measles had again to be set aside in view of more pressing duties, having concern mainly with threatened cholera, and could not be resumed until June 1895. In this way inquiry was made at one or another time as regards 33 districts—22 Urban and 11 Rural.

As result of my investigations I now proceed to consider what measures may be thought of as likely to afford control of measles, and to what extent and in what manner these measures have been resorted to in these 33 districts. In this way will be set forth in Part II. of this report a scheme, classified under three heads, of these measures; while under each of these heads will be found some criticism of the extent and manner of application of these measures by the Sanitary Authorities of the districts referred to. In Part III. will be considered how far the measures described in Part II. are to be regarded as likely to afford that control of measles which it is sought by such means to attain. Detailed statement of the information acquired by me in the 33 districts visited will be found in Addenda A. and B. to this report.

PART II.—AS TO MEANS FOR OBTAINING CONTROL OF MEASLES AND AS TO THE MEASURES ACTUALLY ADOPTED TO THIS END BY SANITARY AUTHORITIES.

These measures will be considered under the following heads, namely:—

1. Sources whence information may be derived by Sanitary Authorities as regards occurrence of measles in their districts.
2. Measures whereby extension of measles within the invaded dwelling may be limited.
3. Measures whereby extension of measles throughout the invaded district may be checked.

1.—SOURCES WHENCE INFORMATION MAY BE DERIVED BY SANITARY AUTHORITIES AS REGARDS OCCURRENCE OF MEASLES IN THEIR DISTRICTS.

The sources whence Sanitary Authorities may derive information regarding occurrence of measles in their districts may conveniently be classified as follows:—

(A.) Notification, compulsory or voluntary, of measles.
(B.) Information received by the Sanitary Authority from School Authorities regarding occurrence of measles.
(C.) Other information received by the Sanitary Authority regarding occurrence of measles.

(A.) NOTIFICATION, COMPULSORY OR VOLUNTARY, OF MEASLES.

In this country compulsory notification of disease is for the most part "dual": that is to say, by the Infectious Disease (Notification) Act, 1889, *both medical attendant and householder are required, in regard of particular infectious diseases, to notify to the Sanitary Authority the existence of each case as it arises. By the provisions of some local Acts, however, the "dual" form is so far modified that the householder is not required to notify unless a medical attendant, on whom the duty would devolve, has not been called in. If, therefore, the law were in each instance obeyed, here would be, in districts where measles is scheduled, an unfailing source of information regarding every case recognised as measles.*

But in practice, as will presently appear, a medical attendant is not always called in when measles makes its appearance in a family: while the householder rarely reports the presence of measles in his dwelling, whether a medical attendant has been called in to see the case or not. To this extent, therefore, compulsory notification of measles commonly fails to afford to Sanitary Authorities complete knowledge of all the cases that occur in their districts.

In the way of remedy two auxiliary measures may be adopted by Sanitary Authorities: namely,—

(*a*) *careful inquiry as to the source of attack of each case reported, combined with search for other cases that may possibly exist in the invaded neighbourhoods; and*
(*b*) *efforts to procure systematic notification by the householder.*

It is evident, as regards (*a*), *that knowledge of measles occurrence afforded by notification should be taken as providing a clue to the detection of unrecognised or unreported cases. Careful inquiry in each instance as to the possible source of infection, supplemented when necessary by house-to-house visitation in the invaded neighbourhood*

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and in any suspected locality, should be the invariable practice of the visiting officers of the Sanitary Authority.

As regards (b), the difficulty has to be faced that it is so little usual for householders to notify cases of any infectious disease to the Sanitary Authority that they are probably in most instances unaware that it is their duty to do so. With a view to awakening householders as to their responsibilities in this matter the Sanitary Authority of a district invaded by measles might, in the early stages of the outbreak, with advantage distribute from house to house in the invaded neighbourhood handbills briefly and in large type impressing on householders that they are bound under penalty to notify to the Sanitary Authority all cases of the disease that may occur in their residences. Such bills might also conveniently be distributed through the medium of schools; and might also, with advantage, be placarded in the invaded and suspected parts of the district. In pursuing this course it is most important that it should be resorted to at a very early stage of a threatened outbreak of measles.

(B.) INFORMATION received by the SANITARY AUTHORITY from SCHOOL AUTHORITIES regarding occurrence of MEASLES.

It is open to Sanitary Authorities to enter into an arrangement with School Authorities whereby the latter are to acquaint the former with any known or suspected cases of measles of which they gain information. This arrangement may be made with the Authorities controlling public elementary, Sunday, and private schools. The information may be either verbal or written, and may, as regards public elementary schools, be conveyed through the Clerk to the School Board or Managers of these schools, or through the School Attendance Officer, or directly by the Masters of the schools. As regards private schools, this information may be afforded by the Masters of those schools; and as regards Sunday schools by the Teachers. The information needs to be given systematically, that is to say, during inter-epidemic periods as well as when epidemics of measles prevail. Sanitary Authorities in receipt of information derived from School Authorities should, it need hardly be said, regard knowledge of cases in this way reported to them as possible clues to the detection of other and unknown cases, and should not fail to make inquiry in the sense already indicated under the heading of Compulsory Notification.

(C.) Other INFORMATION received by the SANITARY AUTHORITY regarding occurrence of MEASLES.

Arrangement may be made by Sanitary Authorities whereby they can become aware of cases, or suspected cases, of measles in one or more of the following ways:—

- *(α.) By means of information, general or particular, on the part of Poor Law Medical Officers, Relieving Officers, or Guardians.*
- *(β.) By means of information from local Registrars of Deaths, as to deaths by measles registered by them. Intimation of this sort, to be of full value, should be sent to the Local Authority by the Registrar immediately on his being informed of death from measles.*
- *(γ.) By means of information from District Visitors and Clergy.*

These measures, while they cannot be regarded as likely in themselves to afford sufficient information as to occurrence of measles, furnish, nevertheless, useful means of obtaining knowledge as to the distribution of the disease.

MANNER AND EXTENT TO WHICH MEASURES ENUMERATED UNDER SUB-HEADINGS (A.), (B.), AND (C.) HAVE BEEN ADOPTED IN THE SEVERAL DISTRICTS VISITED.

Compulsory Notification.—In some two-thirds of the Urban, and in most of the Rural Districts, visited by me, compulsory notification of measles either was in course of trial at the time of my visit or had already been tried and discarded. In all these districts it frequently happened, in the opinion of the Medical Officer of Health, that no medical attendant was called in to attend cases of measles; and further, notification of measles by the householders was a rare occurrence, whether the case had received medical attention or not. Nevertheless, in spite of this recognition of the liability of compulsory notification to fail in affording knowledge of all cases of measles in the invaded district, in little more than a fourth of the districts visited by me in which compulsory notification of measles had been tried, were the auxiliary measures referred to by me under (*a*) systematically resorted to and carefully carried out. In only one of these districts did I find that any of the measures treated of under (*b*) had been adopted by the Sanitary Authority.

As regards those districts in which compulsory notification of measles had been tried and discarded, it appeared, on inquiry, that the grounds on which notification of measles was relinquished were in each instance alleged to be, (1) heavy expenditure in payment of fees for notification by the medical profession, and (2) doubt whether the knowledge obtained by compulsory notification possessed a value corresponding in any sufficient degree to its cost. It is noteworthy that in three of these districts, while the usual fee was payable by the Sanitary Authority to the medical attendant for the first case notified by him, the Authority were not bound to pay any fee for notification of any subsequent case of measles occurring in the same family within 30 days of the first case notified. (*See* Addendum A.) This provision, embodied in certain local Acts, was presumably intended to lessen expenditure by the Sanitary Authority in fees to medical attendants for notification certificates.

Voluntary Notification.—In a few of the districts visited by me trial had been made of voluntary notification by the medical attendant of cases of measles. This system, however, need not here be discussed; since it possesses disadvantages of its own in addition to those held to attach to compulsory notification.

Information through Schools.—As regards arrangements between Sanitary Authorities and School Authorities, I found that in one district only among those visited by me was information as to known or suspected cases of measles systematically supplied to the Sanitary Authority from all schools—public elementary, private, and Sunday—in the district. In about half of these districts this information was systematically provided only as regards children attending public elementary schools. Among the remainder there were instances of information of this sort being given occasionally only, or being apt to lapse—especially in inter-epidemic periods; while in about a fourth of the districts no arrangement had been made with a view to procuring information from School Authorities of any sort regarding occurrence of measles in the families of which members attend school. Even, however, in the districts where arrangements of this sort existed, the knowledge acquired had but rarely been regarded as mainly valuable because of affording possible clues to yet undetected cases; and, accordingly, inquiry in this sense had not often been made by the Sanitary Authority.

Other Sources of Information.—As regards the remaining sources of information as to occurrence of measles, set forth under (c.), reference to Addendum A. will show that in very few of the districts visited by me had any of these methods of acquiring knowledge on the subject been resorted to.

2.—MEASURES WHEREBY EXTENSION OF MEASLES WITHIN THE INVADED DWELLING MAY BE LIMITED.

With the view of preventing spread of measles among the members of families in which the disease has appeared, every household known by the Sanitary Authority to be invaded should at once be visited by an officer of the Health Department for the purpose of ascertaining what steps have been taken towards attainment of proper isolation of the sick person, and of advising, if necessary, further efforts in the direction of safeguarding other inmates of the dwelling. In addition to verbal instruction on this subject, printed forms containing similar advice may with advantage be left with the householder.

During the infectious period the patient, if not removed to a hospital for infectious diseases, should be kept apart from other members of the family, in a suitable room and in charge of an attendant who should have no personal communication with other inmates of the house; and precautions of cleanliness and disinfection should be taken in accordance with the advice contained in the Board's memorandum on the proceedings advisable in places attacked or threatened by epidemic disease. But in those instances where it is found impossible, owing to inadequate house accommodation or other reasons, to properly isolate the sick, it is most desirable that the patient, if the state of his health permit, should be at once removed to a suitable hospital.

In regard of patients allowed to remain at home, frequent visits should be made to the household by officers of the Sanitary Authority, with the view of seeing that precautions against spread of infection are not relaxed so long as there is danger of the disease being communicated to others. Such visits would serve also to aid in early detection of other cases in the same family.

After recovery of the patient or after his removal to hospital, the room or rooms that have been occupied by him, and all articles that may have become infected, should be thoroughly disinfected.

For not less than 14 days after disinfection of the invaded dwelling members of the household should be kept under observation, and they should receive instruction to communicate at once with the Medical Officer of Health on the appearance among them of any suspicious symptoms. Their capacity to recognise such symptoms should be stimulated by verbal instruction on the part of the visiting officer of the Sanitary Authority, and by printed information contained in handbills left with the householder.

MANNER AND EXTENT TO WHICH MEASURES FOR PREVENTING THE SPREAD OF MEASLES WITHIN THE INVADED DWELLING HAVE BEEN ADOPTED IN THE SEVERAL DISTRICTS VISITED.

Reference to the details given in Addendum A. will show that, as regards a few of these districts, it was not the practice for an officer of the Sanitary Authority to pay even one visit to each household invaded by measles; while in a considerable proportion of those districts wherein a visit to such households was usual, it was but seldom that a second visit was paid. In few districts were visits, during the period in which the dwelling remained infected, paid with any frequency to households invaded by measles. Instructions by these visiting officers as to necessary precautions were in some districts but perfunctorily given: in others they were fairly full. Testimony as to the small regard paid to these instructions was almost unanimous in all the districts visited by me: testimony confirmed in many instances by my own personal observation. Imperfect isolation of the sick was of common occurrence, owing to inadequate accommodation in invaded houses, yet in more than three-fourths of the districts no effort had been made to meet this difficulty by removal of measles cases to hospital, and in but two districts had there been any material amount of such removal. Failure of Sanitary Authorities in this respect was attributable in many instances to insufficiency or entire absence of hospital provision for infectious disease. In other instances, however, where little or nothing had in this respect been attempted, there was sufficient hospital accommodation to permit, not, perhaps, of removal thereto of all insufficiently isolated measles cases in the height of an epidemic, but to enable this step to be taken in inter-epidemic periods or in the earlier stages of what might prove to be an epidemic. In one of the districts removal of measles cases to hospital was attempted only under the latter circumstances, and in this way a considerable number of cases of measles had been removed to hospital with, in the opinion of the Medical Officer of Health, satisfactory results as regards checking spread of the disease. Final disinfection of dwellings that had been invaded by measles was rarely, or not at all, performed by the Sanitary Authority in some three-fourths of the districts visited by me. In the remainder it was the practice to disinfect all or most of these dwellings. But even in most of the latter districts the quality of the disinfection was not such as to merit the term "thorough," as may be seen on reference to Addendum A.

It is desirable to note that measures of the sort referred to as having been adopted by some of the Sanitary Authorities "in all cases" had not always been so in the height of an epidemic of measles. On some occasions outbreaks had been so extensive, and the accumulation of cases so rapid, that it was beyond the power of the authorities to deal with them in accordance with their usual practice.

3.—MEASURES WHEREBY EXTENSION OF MEASLES THROUGHOUT THE INVADED DISTRICT MAY BE CHECKED.

These measures may conveniently be considered under the four following heads, namely:—

(A.) Information furnished by Sanitary Authorities to School Authorities regarding occurrence of measles.

(B.) Exclusion of members of households invaded by measles from school.
(C.) School closure.
(D.) Other measures.

(A.) INFORMATION furnished by SANITARY AUTHORITIES to SCHOOL AUTHORITIES regarding occurrence of MEASLES.

Schools are to be regarded as liable, from their bringing large numbers of children together, to act as centres of rapid and extensive propagation of infectious disease among the pupils.

Sanitary Authorities, therefore, in their efforts to obtain control of measles, do well to enlist on their side the School Authorities, and to this end may systematically inform the responsible teachers of the several schools in their district as to the names and addresses of all known cases of measles occurring in families of which members attend school.

By this procedure the Sanitary Authority invites the co-operation of School Authorities in aiding them to exclude from school children suffering from measles and all members of families in which measles has broken out, until such time as the children may with safety to others be re-admitted to school.

(B.) EXCLUSION from SCHOOL of MEMBERS of HOUSEHOLDS invaded by MEASLES.

Not only children themselves suffering from measles, but also all members of the invaded households, should be excluded from school until danger of their communicating the disease to others has passed.

This rule may sometimes be extended with advantage also to children inhabiting houses not yet invaded but in close relation with houses already invaded, and to children in houses which there may be reason to regard as likely to become invaded, by reason of personal communication with houses in which measles is known to have broken out.

Children should not be re-admitted to school from houses that have been invaded by measles in the absence of sufficient evidence as to their freedom from infection. For this purpose a medical certificate would suffice. In the absence of this method a period may be prescribed during which children are not to be re-admitted to school from invaded houses.

(C.) SCHOOL CLOSURE.

The view that aggregation of children in schools gives rise to conditions peculiarly favourable to the spread of any infectious disorder that may make its appearance among them, has led to belief that the closure of a school or schools serving a community in which measles has broken out affords an effective measure of control of this disease. Sanitary Authorities resorting to this measure, as regards public elementary schools, should consider the question of obtaining also closure of private and Sunday schools in the invaded neighbourhood during the period over which closure of public elementary schools is to extend. School closure, if resorted to, should not be adopted while there is reasonable prospect of effectively controlling measles by other means; nor, on the other hand, should it be postponed until prospect of benefit from this measure has well nigh disappeared.

(D.) OTHER MEASURES.

Other measures that may be thought of as likely to check extension of measles throughout an invaded district are as follows:—

(α.) *Precautions against dissemination of measles by means of books sent from public libraries. To this end the librarian of the public library, if there be one in the district, may be systematically informed by the Sanitary Authority of the names and addresses of all persons known to be suffering from measles, with a view to his not supplying books to any member of an invaded household until further informed by the Sanitary Authority that he may with safety do so.*

(β.) *Prohibition of persons residing in households invaded by measles from attendance at work is a measure that may be adopted in instances where continuance of these persons at their occupations is likely to give rise to further spread of the disease.*

(γ.) *Instruction of the public as regards measles may be resorted to with a view to arousing among the public a proper appreciation of the death-dealing effects of measles on the infantine population.*

(δ.) *Sufficiency of sanitary staff. The influence, for success or failure, of the sanitary staff that may be available to carry out measures intended as repressive of measles hardly needs comment. The permanent staff at the disposal of the Sanitary Authority for this purpose should be sufficient to render discharge of the above indicated duties possible, at least in ordinary times. In times of epidemic stress it may be advisable to make temporary addition to the permanent sanitary staff.*

MANNER AND EXTENT TO WHICH MEASURES FOR PREVENTING THE SPREAD OF MEASLES THROUGHOUT THE DISTRICT HAVE BEEN ADOPTED IN THE SEVERAL DISTRICTS VISITED.

Information as to names and addresses of known cases of measles occurring in families of which members attend school was habitually furnished to School Authorities by the Sanitary Authorities of more than half (18) of the districts visited by me. In 7 of these 18 districts, however, this information was furnished to public elementary schools only; in other 7 to private schools also; while in only 4 districts was it furnished alike to Sunday schools, private schools, and public elementary schools.

In all the districts visited by me the Sanitary Authority held that not only children suffering from measles, but also all members of invaded households, should be excluded from school until all danger of their communicating the disease to others was passed. In one district, attendance at school was forbidden, not merely of children inhabiting invaded houses, but also of children inhabiting houses in the vicinity of those invaded. Instructions regarding abstention from school were given by the visiting officer of the Sanitary Authority in all instances in which he visited houses invaded by measles. But the conditions which were made to govern the return of children from invaded dwellings to school varied greatly in the districts visited by me. In nearly half of these there was an arbitrary time-limit to exclusion from school; the dictum of the Sanitary Authority being that children might return to school in a certain number of weeks (varying in different districts) after occurrence of the last case in the dwelling. Statement by returning children that, in the opinion of the medical attendant, the household was free from infection, or

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that the house had been disinfected; opinion of the school attendance officer that children might with safety be re-admitted to school; were, one or other of them, taken as sufficing in different districts. In very few districts was production of a medical certificate as to freedom of the household from infection required. In effect, the manner in which decision was arrived at as to when children might with safety return to school from houses invaded by measles was, in many districts, very unsatisfactory. Clearly, acceptance of the mere statement of children, or of a school attendance officer, as a guide in this matter is undesirable.

Reference to Addendum A. will show that, with a few exceptions, School Authorities in the districts visited by me co-operated with the Sanitary Authorities in their efforts to exclude from school during the period of infection children of households invaded by measles.

In more than two-thirds of the districts visited by me the Sanitary Authority had, with a view to obtaining control of measles, closed on one or more occasions either a particular school or schools, or all the schools in the invaded neighbourhood. For the most part, closure had been restricted to public elementary schools, but in some instances Sunday schools and private schools had been closed also; while in other instances the closure did not extend beyond the infant department of a particular school or schools. I encountered examples of schools having been closed before the conditions of measles prevalence could be held to warrant this procedure; and, on the other hand, examples of this step having been so long delayed that no benefit had been derived or could have reasonably been anticipated from it.

As regards the remaining measures quoted under (D), it will be seen on reference to Addendum A., that few of these were adopted in the districts visited by me. Of these measures, that which has reference to provision of sufficient sanitary staff deserves especial notice; for in many of these districts the sanitary staff could not be regarded as sufficient to cope with the ordinary duties devolving upon them—much less with those that would be entailed by sustained efforts to restrain epidemic prevalence of measles.

From the foregoing summary account, as also from the detailed statements in Addendum A., it will be manifest that there was great discrepancy as regards the measures resorted to by the Sanitary Authorities of the districts dealt with in this report with a view to obtaining control of measles; and also as regards the manner and degree of adoption of each of these measures when resorted to. In some of the districts a much larger proportion of the preventive measures that I have described had been tried than in others, while the thoroughness of application of one or other of these measures had varied greatly even in the same district. In no single one of the districts had all these measures been tested by careful trial, although one or two stood well in advance of the others in this respect. The laxity with which were carried out the measures which I have classified under head 2 as tending to limitation of measles within invaded dwellings was especially worthy of note.

In the course of my investigations I made inquiry, for purposes of comparison, as to the steps taken by the various Sanitary Authorities in dealing with scarlet fever; and in every district the greater attention paid by these Authorities to this disease was clearly evinced either by the greater number of measures adopted or by the greater care displayed in carrying out these measures.

PART III.—THE OBSERVED VALUE OF THE MEASURES THAT HAVE BEEN DESCRIBED AS INTENDED TO AFFORD CONTROL OF MEASLES.

As regards the utility of most of the measures that have been described as intended to afford control of measles, opinions elicited by me in the course of my inquiry were for the most part favourable. There was, I found, general agreement that useful knowledge may be derived by Sanitary Authorities as to occurrence of measles in their districts, by arrangement made with School Authorities and with others referred to in Part II., towards securing information on this subject. There was general agreement, too, among the Authorities of the districts visited by me, that every effort should be made towards obtaining isolation in the home, towards securing sufficient disinfection of invaded houses, and towards exclusion of children inhabiting these houses from school. But there was among persons who had considered these questions considerable difference of opinion as to whether or not Sanitary Authorities should, with a view to obtaining control of measles, resort either to Compulsory Notification of that disease or to the Closure of Schools on account of measles prevalence.

It is desirable, therefore, to consider—even at risk, perhaps, of repetition—each of these points, quoting any facts brought under my observation in the districts visited by me that may tend to cast light upon the question as to the degree of utility that may be regarded as attaching to the one and the other measure.

COMPULSORY NOTIFICATION of MEASLES.

In *favour* of compulsory notification of measles it is commonly contended that, by this means, Sanitary Authorities will obtain early knowledge of many cases that otherwise they are not likely to hear of; that, indeed, other means by which Sanitary Authorities may endeavour to gain this knowledge, while worthy of trial as supplementary aids, cannot be relied upon as main sources of information.

A minority of Authorities hold that by securing information from School Authorities regarding the occurrence of measles in their district, the Sanitary Authority may acquire information sufficient to render it unnecessary for them to resort to the compulsory notification of measles. The experience, however, that I gathered in those districts where trial had, in the absence of compulsory notification of measles, been made of this method, tends to show that it leaves a considerable proportion of cases unknown to the Sanitary Authority. But it should be noted that in none of these districts have cases heard of in this way been regarded as clues to the existence of unreported cases; the same tendency, in fact, has appeared towards regarding the knowledge thus acquired as complete, as appears so often in connexion with compulsory notification. There are, however, special difficulties in the way of even tolerably complete information as to measles occurrence being derived through School Authorities. In the first place, measles is likely to be heard of only in those families of which some member or members attend school; and there are a good many families to which this definition does not apply. In the second place, during the periods when schools are closed, whether at holiday seasons or in consequence of prevalence of epidemic disease, the School Authorities are no longer in a position to supply information as to occurrence of measles; and this result has proved of serious inconvenience to some of the Sanitary Authorities in districts mainly relying on this source of information by removing their principal source of knowledge as to the course of epidemics of measles in their districts. In the third place, while experience indicates that Sanitary Authorities are not usually likely to find difficulty in arranging for obtaining information from the Authorities of public elementary schools regarding occurrence of measles in families members of which attend these schools, it would appear that it is not so easy to make like arrangements with the Managers of private schools. On the whole, therefore, I cannot regard the information derived from School Authorities, even when properly utilised and supplemented by the methods alluded to in Part II., section 1, sub-section (c.), as likely to afford knowledge of measles occurrence sufficient to enable Sanitary Authorities to take such measures as would enable them to keep control of this disease. At the same time information of this sort is, in my judgment, of very great value, and should in every district be provided by the Authorities of all schools, whether public elementary, Sunday, or private.

It has also been urged in favour of compulsory notification of measles that this measure would lead to increased appreciation by the public of the serious nature of this disease. It is held by many that the omission of measles from the list of diseases scheduled as compulsorily notifiable tends to encourage the mistaken popular impression that measles is a malady of which, from its unimportance, little notice need be taken. It is contended that the difference of treatment that in this respect obtains, in the vast majority of the Sanitary Districts of England and Wales, between this disease and diseases such as scarlet fever or diphtheria, tends to accentuate a common error, and, to some extent, affords to the public an apparent justification of the light esteem in which measles is too frequently held by them.

On the other hand *objections* have been put forward against compulsory notification of measles to the following effect: —

(1.) That in a varying, but sometimes considerable, proportion of cases the disease is not reported to the Sanitary Authority owing to no medical attendant being called in: with the result that there is necessarily no medical notification, while the householder seldom notifies under these or any other circumstances.

(2.) That measles is highly infective for some two or three days before diagnosis of the real nature of the malady is possible; and that, in consequence, it may be communicated to others before cognisance is had of the infectious character of the illness, and before notification is made of the disease and proper precautions taken as result of such notification.

(3.) That not only is it frequently impossible to isolate measles cases properly in their homes; but also that the magnitude of epidemics of this disease is often such that if the cases were to be dealt with in hospital, an amount of accommodation of this sort would be required far in excess of that which is at present deemed sufficient, an amount, too, that would entail enormous expenditure of money.

(4.) That fees paid to medical men for notification of measles cases frequently amount to very large sums; and that, in epidemics of any magnitude, the Sanitary Authority would require extra staff to enable them to maintain control of the disease, whereby additional increase of expenditure would be incurred.

As regards the *first* of these objections, the experience in all those districts visited by me, where compulsory notification of measles was or had been in force, was that medical aid was frequently not sought for children attacked by this malady; and the facts quoted by me in Addendum A. show very clearly in how few districts there had been any appreciable amount of notification of measles to the Sanitary Authority by the householder. Yet most of these Sanitary Authorities had been content to accept the information provided by notification as if it were complete, instead of recognising its defective character, and, as a consequence, utilising the reported cases as clues to the existence of other unreported and undetected cases. In this way they might have, at least in part, succeeded in filling the lacunæ in the confessedly incomplete data furnished by compulsory notification. Some of them, too, had not availed themselves of information to be obtained from the School Authorities and in other ways set forth in this report; acting, in effect, as if complete information as to measles occurrences were supplied by compulsory notification. Neither had proper effort been made in any district save one to bring home to the householder the fact that, under this system, he is bound under penalty to notify cases of measles to the Sanitary Authority—a procedure that may be thought of as likely to conduce to the acquisition of knowledge regarding cases that are not under medical care. While, therefore, the experience of these districts tends to show that this objection is to a considerable extent valid, it also appears, as result of my investigations, that in none of them had any well-considered attempt been made to supplement the shortcomings of compulsory notification.

As regards the *second* objection, no data for definite judgment were available in any of the districts visited by me. It is, however, matter of usual belief at the present time that measles is more likely to be communicated to others in the period between the onset of the disease and the appearance of the rash (on which diagnosis is generally based) than is, for instance, scarlet fever; and this owing either to the greater infectivity of measles during that period or to the greater duration of that period, or to both these conditions. It is to be observed, however, that an energetic Sanitary Authority will, on becoming aware of the occurrence of a case of measles in their district, keep under observation all those who are known to have come in contact with the sick person, with a view to detecting early symptoms in any of these of illness that may prove to be measles, and to securing isolation even when the true nature of the illness remains doubtful.

As regards the *third* objection, the experience of all the districts visited by me undoubtedly indicated that there is great difficulty in procuring satisfactory isolation of measles cases in their homes. This may be regarded as due in part to the very infectious nature of measles, which is such as frequently to preclude possibility of arrangements likely to prevent further spread of the disease to other members of such families as are provided only with the scanty accommodation usual in the houses of the poorer classes. Partly, also, it is attributable to the disregard which, as indicated by me in Addendum A., is so often met with as to instructions respecting need for precautions against spread of measles infection. The attitude of great part of the public towards this matter is summed up in their frequent expression "It's only measles." Under these circumstances, removal of cases insufficiently isolated to hospital would appear to be indicated; but in this regard the experience afforded by the districts visited by me was very scanty. In none of these districts had any attempt been made to remove all insufficiently isolated cases to hospital during the height of a serious epidemic; and, indeed, the plea that this would entail very large hospital accommodation and enormous expenditure of money appears to be beyond a doubt. But, according to the experience of the Sanitary Authority in one of the districts visited, removal of measles cases to hospital in inter-epidemic periods, or during such time as epidemics had not passed beyond control, is a measure for which no unusual amount of hospital accommodation is needed, and which, in that particular district, was considered by the Authority to have proved of marked utility.

As regards the *fourth* objection, the experience of very many districts visited by me was that measles, when compulsorily notifiable, is more costly in the way of notification fees than any other infectious disease to which this measure has been applied. Indeed, as I have noted, in every district where I found that compulsory notification of measles had been discarded after trial, the expenditure in fees to the medical profession proved always to have been a determining consideration towards revocation. In four of the districts visited by me a fee was paid for the first case of measles notified, but no notification was required for further cases in the family during the 30 days following notification of the first case, and no fee was paid for such notification if made. This provision was no doubt intended to lessen expenditure by the Sanitary Authority in fees; nevertheless, in three of these four districts compulsory notification of measles had been discarded. In the fourth district, in addition to the foregoing provision, the Sanitary Authority paid a fee of 1*s.* only for each certification of measles; and in this way considerable saving was effected. As to added expenditure caused by temporarily increased staff during epidemics of some magnitude, no experience was forthcoming in any district that I visited, none of the Sanitary Authorities concerned having made any noteworthy effort in this direction. In considering the probable amount of added expenditure that would in this way be incurred, it is to be borne in mind that for the most part measles epidemics, even when of considerable magnitude, are apt to be of comparatively short duration; and that, accordingly, the temporary increase of staff would probably not be required for any long period.

In attempting to arrive at a just estimate of the value of compulsory notification as affording means towards obtaining control of measles, it would not be proper to draw unfavourable conclusions from statistics that might indicate no decrease in prevalence of this disease in those districts that have resorted to this measure. For, as I have already pointed out, every measure likely to supplement the deficiencies in information provided by compulsory notification should be adopted; and subsequent precautions to prevent spread of the disease should be thorough. So much as this, however, cannot be said of any district visited by me where trial has been made of compulsory notification of measles; and accordingly it would be unjust to draw conclusions as to the value of this measure from any results hitherto apparent in these districts. The problem of how to obtain control of measles is one of great difficulty for Sanitary Authorities. It is clear, however, that a necessary preliminary to taking precautions against spread of this disease is the possession of knowledge as to its occurrence, and my investigation of methods that may be employed to this end has led me to the conclusion that compulsory notification of measles, properly utilised, is likely to prove of no little value. It is a measure which, in my judgment, should be adopted by every Sanitary Authority, whether Urban or Rural, that is desirous of obtaining control of measles. But information obtained as result of this measure, when adopted, should be recognised as being almost certainly incomplete, and as of value mainly in affording a clue to the existence of other cases to be sought for in the manner already indicated; and notification by the householder should be stimulated in the ways previously referred to in this report. Nor should Sanitary Authorities neglect to avail themselves of other sources of information which may serve to reveal cases of measles not detected in the foregoing way. In effect, the difficulties in the way of acquiring full knowledge as to occurrence of measles in their districts are so considerable that Sanitary Authorities desirous of dealing effectively with this disease should avail themselves of every source of information likely to prove of utility. They would, accordingly, do well, not only to make use of compulsory notification, but also to take advantage of the means of knowledge afforded by arrangements with School Authorities and by the other measures already described in this report. Further, the knowledge thus acquired should not be wasted by neglect in taking every necessary precaution against spread of the disease by persons known to be attacked.

Epidemics of measles, it is true, are apt to be of considerable magnitude, and in more populous places, at least, of considerable frequency. Nor, in view of the apathy and carelessness of the public as regards measles, is it to be hoped that, for some time to come, even in districts where every means of acquiring knowledge of occurrence of this disease is utilised and due care exerted to prevent its spread, the Sanitary Authority will not from time to time find that outbreaks pass beyond their control. Under these circumstances the payment of a long bill due for information which events have rendered of comparatively little value is apt to be resented, and so leads to thoughts of discarding the measure responsible for this expenditure. It is thus that plea has now and again arisen for modification, so far as measles is concerned, of the usual system of compulsory notification in the direction of lessened expenditure in fees. Two such modifications I have noted as existing in virtue of provisions in local Acts in certain of the districts dealt with in this report.

SCHOOL CLOSURE.

Data of a sort to afford opportunity for estimating the value of school closure as a means of obtaining control of measles were available in but few of the districts visited by me. In certain localities, however, trial had been made of school closure on several occasions of measles prevalence, and it had, therefore, been possible to accumulate a not inconsiderable amount of statistics bearing on the effect of this measure in checking spread of measles. These data will be found in Addendum A., together with brief remarks in each instance regarding the points that appear to merit particular notice.

As regards these statistics, it is to be noted that they have reference, less to school closure as a means of reducing incidence of measles upon children attending the particular school or schools closed, than to school closure as a measure whereby spread of the disease throughout the invaded district may be prevented or materially lessened. Accordingly these statistics take account, not of the relative incidence before and after school closure of measles upon children attending the particular schools closed, but only of the known amount of this disease in the whole of the invaded neighbourhood before and after the adoption of this measure. In at least some of those instances in which no decrease in prevalence of measles in the locality has seemed to follow upon closure of particular schools, it may, nevertheless, have happened that certain children attending these schools escaped attack in consequence of their closure, and that, to this extent, this measure may have been beneficial. It is, accordingly, open to contention that real advantage from closure of invaded schools may, as suggested later in this Report, result in Urban districts, where schools are numerous, though no apparent decrease in prevalence of measles over the district as a whole is evident;

and this because the disease may invade school after school in succession, and spread from these as centres before their closure is resorted to. But it should be borne in mind that closure of particular schools on account of measles prevalence has for its object, not merely safeguarding children attending these schools from attack, but is intended also—and mainly—to check spread of the disease throughout the neighbourhood. It is, accordingly, to the latter point that the statistics in Addendum A. specially refer.

In considering what conclusions may with safety be based upon such facts and figures as appear in Addendum A. on this subject, it is necessary to bear in mind that material decrease in the number of known cases of measles following closely upon the closure of a school or schools in an invaded neighbourhood may not actually be due to that measure. For such decrease may be due to exhaustion of susceptible human material in the locality, or to that seasonal decadence of measles which so often manifests itself towards the months of June and December.

On the other hand, it is to be borne in mind that it is not essential to suggestion of beneficial result that there be a marked drop in the amount of the disease at the end of two weeks from closure of schools. For the occurrence of second and third cases in already invaded houses may for a time retard the decrease of cases that might be anticipated from complete or nearly complete cessation of invasion of fresh households. It may accordingly be claimed that instances in which marked decrease of the disease does not appear until some three weeks have elapsed after school closure are not on this account to be regarded as affording examples of failure of this measure.

If due regard be had to the several considerations I have indicated, examination of the statistics in Addendum A. in reference to school closure tends to the conclusion that in several of the instances quoted no definite judgment as to the effect of this measure on an outbreak of measles is possible. In other instances, however, inference may be drawn with greater promise of validity, and the balance of evidence afforded by these is on the whole in favour of school closure as tending to furnish a means of control of measles. It is desirable, however, to distinguish between the apparent influence of closure of all the departments of schools and that of closing the infant departments only; and also to make distinction as to the nature of the districts—whether Urban or Rural—in which the one or the other closure measure was adopted. As regards instances, then, where all the departments of one or more schools were closed, the evidence afforded by the data referred to is decidedly favourable to the utility of this measure in Rural districts, while in Urban districts the evidence is more equivocal. As regards closure of infant departments only of schools as a preventive measure in outbreaks of measles, no statistics of sufficient completeness were available for any of the Rural districts visited by me, while the statistics annexed in Addendum A. in reference to Urban districts are rarely such as to indicate that in this way control of measles had been attained to any material extent. The apparently smaller measure of success attending school closure in Urban districts may with some show of probability be attributed to the disease manifesting itself in schools not yet closed, and spreading from these as centres. In this way school after school may, before closure in each instance is resorted to, in turn serve to keep up prevalence of measles in the district. Indeed, this hypothesis is distinctly suggested by some of the data given in Addendum A., in reference to Urban districts and Rural neighbourhoods served by more than one school. As regards the not altogether encouraging nature of the statistics bearing on results of closure of infant schools, it must be borne in mind that in every instance concerning which sufficient data were forthcoming this measure was adopted in *Urban* districts, where results of school closure in general do not come out so favourably as in Rural districts.

In considering the unfavourable or doubtful tendency of some of the statistics in Addendum A. regarding the effect of school closure on measles outbreaks, it should not be overlooked that there are many instances in which closure of public elementary schools was not accompanied by closure of Sunday schools and of private schools (if any) in the invaded neighbourhood. For Sanitary Authorities, while they are empowered to close public elementary schools with a view to preventing spread of infectious disease, have no such power as regards Sunday or private schools unless by a provision of some local Act. Consequently Sunday and private schools can ordinarily be closed only with the consent of the School Authorities, and consent is not infrequently refused. It hardly needs pointing out that benefit to be got from closure of public elementary schools may be lessened or negatived by private and Sunday schools becoming foci whence measles are being disseminated. The closure of Sunday schools, along with public elementary schools, would appear to be especially desirable, since, in a given locality, the children attending the public elementary school attend for the most part also the Sunday schools. Continuance, therefore, of attendance at Sunday school would expose a number of children, once a week, to that very risk of infection which had led to closure of public elementary schools.

It is but justice, also, in attempting to estimate the value of school closure as a means of control of measles, to remember that perhaps better results would be apparent if other precautionary measures taken by Sanitary Authorities were completer and more thorough. I append a table which shows how, in a particular Rural district, the closure of the two schools serving a neighbourhood that had been invaded by measles was followed, as regards each school, by rapid cessation of attacks in families of which members attended school, the disease, however, *still continuing to invade other houses.* There were 802 inhabited houses in the invaded neighbourhood:—

TABLE V.

During the Week ending	Sept. 29.	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 27.	Nov. 3.	Nov. 10.	Nov. 17.	Nov. 24.	Dec. 1.	Dec. 8.	Dec. 15.	Dec. 22.	Dec. 29.	Total.
Number of cases of measles known to S.A.	3	21	70	53	44	26	12	7	5	1	—	1	1	3	247
Number of houses freshly invaded by measles.	2	16	41	27	11	11	5	2	1	—	—	1	—	—	117
Freshly invaded houses connected with school A.*	1	14	36	18	—	—	1	—	—	—	—	—	—	—	70
Freshly invaded houses connected with school B.†	1	—	5	3	3	4	2	—	—	—	—	—	—	—	18
Freshly invaded houses not connected with any school.	—	2	—	6	8	7	2	2	1	—	—	1	—	—	29

* School A. was closed from October 3rd to November 14th.
† School B. was closed from October 23rd to November 28th.

From this table it appears that before the end of the third week after closure of School A. there was—with a single exception in the week ending November 10th—entire cessation of invasion by measles as regards families of which members attended that school; while, as regards school B., fresh invasions of families attending that school ceased in less than three weeks after its closure. During the four weeks, September 23rd–October 20th, 78 houses connected with either School A. or School B., and eight houses unconnected with either school, were freshly invaded by measles; whereas during the following four weeks, October 21st–November 17th, while both schools were closed, 10 houses connected with one or other of these schools, and 19 houses unconnected with any school, were freshly invaded by measles.

On the whole, then, school closure is to be regarded as a measure which may prove of decided utility to Sanitary Authorities attempting to control measles, and more especially in Rural districts. But it should never be forgotten that this measure involves for a time a serious check to education, and, accordingly, should not be resorted to hastily. In the course of my inquiry I encountered several instances where schools had been closed because of the appearance of two or three cases, or even of a single case, of measles in the neighbourhood. Under such circumstances resort to school closure appears to be uncalled for, and is, indeed, likely to bring this measure into disrepute. The exclusion from school of all members of families in which measles has made its appearance, and, if necessary, of members of families that reside in the near neighbourhood of, or that have been in communication with, invaded households, is a measure which, if promptly carried out, might frequently be found to obviate the need for taking the much graver step of closing a whole school or several schools. The closure of infant departments only, however, involves considerably less interference with the course of education than is caused by the closure of all departments of schools; and it will be encouraging, alike to Sanitary and to School Authorities, if more extended trial of this limited form of school closure should show that better results may be anticipated from it than appear from the data furnished on this subject in Addendum A.

THEODORE THOMSON.

December 9th, 1895.

[The details respecting the experience of particular districts were sought, as matter of first instance, solely for the information of the Board's Medical Department. Wherefore the districts referred to in Addenda A. and B. which follow, are none of them designated by name. —T. T.]

ADDENDUM A.

Districts (represented by Symbols) visited in connection with this Inquiry, with Particulars in each instance as to Population, Acreage, and Date of Visit.

("U." signifies "Urban" and "R." signifies "Rural" District.)

Symbol.	Population at 1891 Census.	Area in Acres.	Date of Visit.	Date of Re-visit.
U. 1	107,573	4,089	July 1891.	—
U. 2	33,675	728	Aug. 1891	June 1895.
U. 3	4,655	4,550	Aug. 1891.	—
R. 1	17,929	128,475	Aug. 1891.	—
U. 4	1,082	3,971	Aug. 1891.	—
U. 5	99,857	3,849	Sept. 1891	July 1895.
U. 6	42,061	6,002	Aug. 1891.	—
U. 7	54,946	1,768	July 1891.	—
U. 8	120,064	6,974	July 1891.	—
U. 9	78,391	1,839	Aug. 1891	June 1895.
U. 10	23,846	3,610	Aug. 1891	July 1895.
U. 11	115,002	2,357	Sept. 1891.	—
U. 12	60,054	5,878	Aug. 1891.	—
U. 13	38,060	3,945	Sept. 1891.	—
R. 2	11,452	61,756	Sept. 1891.	—
U. 14	9,636	2,099	Dec. 1892.	—
U. 15	115,873	2,529	Dec. 1892.	—
U. 16	186,300	5,371	Jan. 1893	June 1895.
U. 17	85,692	3,138	Jan. 1893.	—
U. 18	94,146	3,450	Jan. 1893.	—
U. 19	35,427	2,386	Jan. 1893.	—
U. 20	367,505	21,572	Jan. 1893.	—
U. 21	174,624	8,586	June 1895.	—
R. 3	30,033	165,008	June 1895.	—
U. 22	10,485	1,917	July 1895.	—
R. 4	22,220	61,258	July 1895.	—
R. 5	11,835	46,557	July 1895.	—
R. 6	28,717	22,766	July 1895.	—
R. 7	11,204	52,189	Sept. 1895.	—
R. 8	10,119	52,451	Sept. 1895.	—
R. 9	13,828	20,110	Sept. 1895.	—
R. 10	12,188	64,893	Sept. 1895.	—
R. 11	14,631	34,735	Oct. 1892.	—

1.—SOURCES OF INFORMATION DERIVED BY SANITARY AUTHORITIES AS REGARDS OCCURRENCE OF MEASLES IN THEIR DISTRICTS.

1. *Notification, Compulsory or Voluntary, of Measles.*

The following list shows which of the places visited by me in connection with this Inquiry have resorted to notification, whether compulsory or voluntary, of measles; and also, in each instance, the period or periods over which such notification has extended. An asterisk is placed opposite each district in which measles has at any time been scheduled under the provisions of a local Act:—

*U. 1. Compulsory notification of measles, October 1st, 1880—August 11th, 1884.

*U. 2. Voluntary notification of measles, Dec., 1880—Sept., 1882.
,, ,, ,, Nov., 1883—March, 1884.
,, ,, ,, April, 1885—July, 1885.
,, ,, ,, June, 1886—Oct., 1886.
Compulsory ,, ,, July, 1887—Feb., 1894.

(From July 1887 to April 1890 compulsory notification of measles was under a local Act; after April 1890 it was under the Infectious Disease (Notification) Act, 1889.)

U. 3. Voluntary notification of measles during the years 1888 and 1889.
Compulsory notification of measles, Feb. 14th, 1890—Feb. 20th, 1891.

U. 4. Voluntary notification of measles during the years 1888 and 1889.
Compulsory notification of measles, April 16th, 1890—Jan. 19th, 1891.

*U. 5. Compulsory notification of measles since 1881. This provision was still in force on the occasion of my visit in July, 1895.

*U. 6. Compulsory notification of measles since 1879. This provision was still in force on the occasion of my visit in August 1891.

U. 7. Voluntary notification of measles for short periods in 1887, 1888, and 1891.
Compulsory notification of measles (for a period of six months), from May 20th, 1891.

*U. 8. Compulsory notification of measles, 1879-1882; and from Dec. 15th, 1890, to May 1st, 1891.

*U. 10. Compulsory notification of measles since 1879. This provision was still in force on the occasion of my visit in July 1895.

*U. 11. Compulsory notification of measles, Sept. 1877—April 1879.

*U. 12. Compulsory notification of measles since 1881. This provision was still in force on the occasion of my visit in August 1891.

U. 13. Compulsory notification of measles since Dec. 12th, 1889. This provision was still in force on the occasion of my visit in September, 1891.

U. 14. Compulsory notification of measles since July 13th, 1891. This provision was still in force on the occasion of my visit in December, 1892.

*U. 18. Compulsory notification of measles during some nine months of 1880.
Voluntary notificaton, Jan. 8th, 1884—March 21st, 1884; Oct. 31st, 1887—Jan. 9th, 1888.

U. 19. Voluntary notification of measles, Jan. 1885—Aug. 1886.

U. 22. Compulsory notification of measles, June 1893—Feb. 1895.

In U. 9, U. 15, U. 16, U. 17, U. 20, U. 21, there has not at any time been adopted any system of compulsory or voluntary notification of measles.

R. 1. Voluntary notification of measles during 1888 and 1889.
Compulsory notification of measles, Feb. 14th, 1890—Sept. 26th, 1890.

R. 2. Compulsory notification of measles since Feb. 10th, 1890. This provision was still in force on the occasion of my visit in September 1891.

R. 5. Compulsory notification of measles since Jan. 1st, 1891. This provision was still in force on the occasion of my visit in July, 1895.

R. 6. Compulsory notification of measles since July, 1890. This provision was still in force on the occasion of my visit in July, 1895.

R. 7. Compulsory notification of measles, April 25th, 1890—April 10th, 1894.

R. 9. Compulsory notification of measles, Jan. 1st, 1890—April 23rd, 1895.

R. 10. Compulsory notification of measles since Jan. 1st, 1890. This provision still in force in September 1895.

R. 11. Compulsory notification of measles since March 17th, 1890. This provision was still in force on the occasion of my visit in October 1892.

In R. 3, R. 4, and R. 8, there has not at any time been adopted any system of compulsory or of voluntary notification of measles.

From the foregoing list it appears, as regards the 33 places therein quoted, that *compulsory* notification of measles was in force in 7 Urban and 5 Rural districts at the times when I visited these districts; that in 7 Urban and 3 Rural districts trial had in the past been made of *compulsory* notification of measles, but that this measure had been revoked before I visited these districts; and that in the instance of one Urban district twice visited by me, measles, which was compulsorily notifiable on the occasion of my first visit, had ceased to be so before the date of my second visit. It appears also that in 1 Rural and 6 Urban districts *voluntary* notification of measles had been tried, while in 6 Urban and 3 Rural districts trial had not at any time been made of either compulsory or voluntary notification of measles.

The form of compulsory notification resorted to was for the most part "dual": that is to say, the duty of notifying the existence of measles cases was incumbent on the householder in whose residence the disease had broken out as well as on the medical attendant of the person affected. In "dual notification," as prescribed by the Infectious Disease (Notification) Act, 1889, *every* case of the disease scheduled is to be notified to the Sanitary Authority by both medical attendant and householder. But in certain of the districts that I visited compulsory notification, under local Acts, differed somewhat from this form as regards the duty imposed on the medical attendant. Thus in U. 1, U. 8, U. 12, and U. 18, the medical attendant has to notify measles cases that he is "attending on or called in to visit" and for this notification he receives a fee; but, "only one such certificate need be given, and "only one such fee shall be payable within an interval of thirty days to "the same medical practitioner in respect of the same disease occurring "in the same building." In U. 1 (population 107,573) during the period when, in this sense, compulsory notification of measles was in force (October 1, 1880—August 11, 1884) 1,619 cases of measles were reported by medical practitioners to the Sanitary Authority. In U. 12 (population 60,054) 5,998 cases of measles were reported by medical practitioners to the Sanitary Authority during the nine years 1882–1890. A further variation of compulsory notification was found in U. 1, U. 5, and U. 8. In these districts local Acts required the householder to notify only when "no registered medical practitioner be attending on or has been called in "to attend" the person suffering from measles. But in the 23 districts visited in which notification of measles had at one or another time been compulsory, it appeared that in most instances information regarding occurrence of the disease had either never been given by the householder to the Sanitary Authority or that such information had been so rare as to be almost a negligible quantity; and this whether the provisions as to notification by the householder were such as those set forth in the Infectious Disease (Notification) Act, 1889, or of the sort quoted as prevailing in districts U. 1, U. 5, and U. 8. Exceptions to this general rule were found in districts U. 3, U. 4, U. 14, U. 22, and R. 1, in which of the total notifications received the proportion notified by the householder amounted to 57 per cent., 60 per cent., 25 per cent., 12 per cent., and 60 per cent. respectively.

In each district inquiry was made by me as to whether the knowledge acquired by means of compulsory notification of measles had been properly and fully utilised in such manner as to lead to discovery of unreported cases; as for instance, by inquiry as to the source of the disease, by visiting houses between which and invaded houses there had been communication, by house-to-house visitation in the neighbourhood of the invaded dwelling, or by inquiries throughout a wider area. These measures would appear to have been adopted in only six (U. 2, U. 7, U. 10, R. 5, R. 10, R. 11) of the 23 districts which I have cited as having made trial of compulsory notification of measles.

Voluntary notification has, as I have already stated, been tried in seven of the districts visited by me; namely, in six Urban and in one Rural district. This form of notification had in no instance been dual, but was solely by the medical attendant. In the Rural district and in four of these six Urban districts voluntary notification was given up in favour of compulsory notification. In one district (U. 18) it succeeded a short trial of compulsory notification, but was only twice resorted to, and on both occasions some time after measles had become epidemic in the district. In U. 19 a system of voluntary notification had been tried for some 20 months; but, according to the Medical Officer of Health, only about 50 per cent. of what he regarded as the probable number of measles cases in the district during that period had in this way come to the knowledge of the Sanitary Authority.

2. *Information received by the Sanitary Authority from School Authorities regarding occurrence of Measles.*

In one only (R. 9) of the 33 districts visited by me has arrangement been made whereby systematic information regarding suspected occurrence of measles in families of which members attend school is furnished to the Sanitary Authority by the Authorities of all schools in the district—whether public elementary, Sunday, or private schools. In 12 Urban and 6 Rural districts—namely, U. 5, U. 7, U. 9, U. 10, U. 11, U. 12, U. 13, U. 14, U. 15, U. 16, U. 21, U. 22, R. 3, R. 4, R. 5, R. 7, R. 8, and R. 11—arrangement of this sort has been made as regards public elementary schools, but not as regards Sunday or private schools. Information acquired in this way is given to the Sanitary Authority in some instances by schoolmasters or teachers, in some instances by the school attendance officer, and in other instances in both of these ways. Such information in some places is given by verbal communication, in others by letter or by filling in printed forms, of which specimens are annexed in Addendum B.

This sort of information, however, is not always furnished in accordance with arrangement. Thus in two districts (U. 9 and R. 4) I was informed that the School Authorities are apt to give information regarding measles cases only when there is considerable prevalence of the disease in the district, and to neglect to provide information regarding the earlier cases which have preceded this considerable prevalence. In another district (R. 3) it appeared that, while the School Authorities did usually supply information systematically in accordance with arrangement, yet there were occasions when they failed to do so.

In one Urban district (U. 2) I found, on the occasion of my first visit, that systematic information regarding cases suspected to be measles was being given to the Sanitary Authority by the school attendance officer; but on my revisiting the place some four years later I found that this practice had ceased in consequence of relations between the School Authorities and the Sanitary Authority having become strained. In another district (U. 8) it was, for a time, the practice of the school attendance officer to supply a list of children absent from school by reason of any sort of illness; but it was found that the number of names on these lists was often so considerable as to render the making of necessary inquiries a work of great labour, while, as result of these inquiries, it seldom appeared that infectious disease was the cause of absence. In three districts (U. 20, R. 6, and R. 10), while information as to occurrence of illness suspected to be measles is not systematically given, yet occasionally the public elementary school Authorities do provide this information, either when asked by the Medical Officer of Health to do so, or because they have reason to believe that measles has become very prevalent in the district.

Proper use—in the sense referred to in the body of this report under the heading of Compulsory Notification—has not been made of the knowledge in this way acquired, save in the six districts previously referred to as having fully utilised the information given by compulsory notification of measles.

There is no arrangement whereby information regarding cases known or suspected to be measles shall be provided by the School Authorities to the Sanitary Authority in the following districts: U. I, U. 3, U. 4, U. 6, U. 17, U. 18, U. 19, R. 1, R. 2.

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3. *Other Information received by the Sanitary Authority regarding occurrence of Measles.*

(1.) *Information from Poor Law Officers.*—In two districts (U. 15 and R. 2) arrangement has been made that poor law medical officers shall notify to the Sanitary Authority, without charge, paupers attacked by measles and attended by them. In R. 2 this arrangement ceased on the Sanitary Authority scheduling measles under the Infectious Disease (Notification) Act, 1889. In another district (U. 16) the medical staff of the public dispensary, for a considerable length of time, notified cases of measles to the Sanitary Authority without charge; but this practice ceased when the Infectious Disease (Notification) Act, 1889, was adopted in the district, although measles was not scheduled under the Act. In another district (R. 3) each guardian informs the Medical Officer of Health of cases in his neighbourhood suspected to be measles. In another district (R. 4) similar information is furnished to the Medical Officer of Health by the relieving officers.

(2.) *Information given by local Registrars of Deaths.*—In three districts (U. 9, U. 15, U. 16) a postcard is sent to the Sanitary Authority by each local registrar of deaths immediately on his receiving information regarding occurrence of a death from measles. For each postcard a small fee is paid to the registrar by the Sanitary Authority.

(3.) *District Visitors and Clergy* systematically afford information regarding occurrence of cases suspected to be measles to the Sanitary Authority in one district (U. 15).

2. MEASURES WHEREBY EXTENSION OF MEASLES WITHIN THE INVADED DWELLING MAY BE LIMITED.

(1.) *Visitation of invaded dwellings by an Officer of the Sanitary Authority.*—In all the districts visited by me, save four, dwellings known to be invaded by measles are said to be visited by an officer of the Sanitary Authority shortly after receipt of this information by the Authority. It was pointed out to me, however, in almost all the districts in which such visitation is practised, that in widespread epidemics, where large numbers of persons were attacked within a short period, this practice was liable to fail on account of want of necessary staff. The four districts in which it is not the practice to visit all houses reported as invaded by measles, even when this is not rendered difficult by exceptionally widespread prevalence of the disease, are U. 19, U. 22, R. 4, and R. 9. In U. 19, indeed, all houses reported as invaded by measles were visited by an officer of the Sanitary Authority during the period when a system of voluntary notification was in force in the district; but with cessation of voluntary notification of measles came also cessation of visits to houses known to be invaded by this disease. In U. 22 about half of the houses reported as invaded by measles are visited by an officer of the Sanitary Authority; as regards the remainder the Sanitary Authority contents itself with requesting the medical attendant to give necessary instructions as to isolation and other precautions. In R. 4 dwellings known to be invaded by measles are "very rarely" visited by an officer of the Sanitary Authority. In R. 9 also such visits are rare; but the Sanitary Authority writes to the medical attendant requesting him to give necessary instructions as to isolation. But while first visits are, as stated, made in 29 of the 33 districts, in many of these 29 places the officers of the Sanitary Authority in most instances content themselves with this, and make no further visit to the invaded dwelling. Thus further visits are stated to be made "rarely" in U. 1, U. 3, U. 4, U. 6, U. 11, U. 14, R. 1, and R. 10. In others, again, as in U. 12 and R. 6, it is usual to pay one visit only subsequent to the first. In some districts subsequent visits are more frequently made, as, for example, in U. 10 and R. 5, "at irregular and varying intervals"; in U. 4, once a fortnight; in U. 20, U. 21, and R. 3, once a week; in U. 7, U. 15, and U. 18, twice a week; while in one district, R. 11, dwellings and neighbourhoods invaded by measles are visited almost daily so long as the cases of measles are few in number, in the hope that strict supervision of this sort may prevent the disease assuming epidemic proportions.

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(2.) *Instructions given by the Sanitary Authority as regards isolation of the sick in their homes.*—The instructions given by the visiting officer of the Sanitary Authority are usually to isolate the sick person "as far as practicable." That is to say, where the circumstances of the invaded household are such as to permit segregation of the infective person in a separate room with separate attendant, these and the other recommendations desirable in dealing with infectious disease are made. But in those houses of the poorer class where such precautions are manifestly not to be looked for, a smaller measure of isolation is recommended. In most districts advice to procure a separate attendant for the sick person is not given to the poorer classes; but the retention of the patient in a separate room is usually advised. As matter of fact, however, in only one (U. 10) of the 33 districts were the officers of the Sanitary Authority prepared to maintain that any great regard is paid to this instruction by the poorer classes. And my own experience of those districts where measles chanced to be prevalent at the time of my visit, and where I made personal investigation of this matter, tends to the conclusion that instruction of this sort is usually disregarded by the poor, who allow sick and healthy to mingle together unrestrainedly in the dwelling. So well recognised is this condition of things by most of the 33 Sanitary Authorities that, while advising isolation within the dwelling to the extent described, they mainly lay stress on the need for infective persons remaining indoors and for children from other households not being allowed to enter the invaded dwelling. In one district, indeed (U. 16), the only instruction given to the poorer classes is that children occupying the invaded houses are "not to play with other children until "the house has been disinfected." And my own observation showed me that in that district—as in several others—even this elementary principle of isolation is not always regarded.

In 17 of the districts visited instructions as to isolation are verbal only; in addition to verbal instruction, printed notices as regards necessary measures of isolation and disinfection are left at houses invaded by measles in the following districts:—U. 2, U. 7, U. 8, U. 9, U. 10, U. 11, U. 12, U. 13, U. 14, U. 15, U. 17, U. 20, R. 5, R. 7, R. 8, and R. 10. Specimens of some of these notices are to be found in Addendum B.

(3.) *Removal of Measles cases to Hospital.*—Of the 33 districts visited by me, 11 have no hospital for infectious disease, viz.—U. 14, U. 22, R. 2, R. 3, R. 4, R. 5, R. 6, R. 8, R. 9, R. 10, and R. 11. Two of these districts, indeed, U. 22 and R. 2, make use of the infectious diseases hospital of adjacent districts, but from neither district have cases of measles ever been removed to hospital. In other 15 districts, although there is hospital accommodation for infectious diseases, cases of measles have never been removed to hospital, viz.—U. 1, U. 2, U. 3, U. 4, U. 6, U. 7, U. 8, U. 11, U. 12, U. 13, U. 18, U. 19, U. 21, R. 1, and R. 7. In the remaining seven districts, cases of measles have been removed to hospital, viz.—U. 5, U. 9, U. 10, U. 15, U. 16, U. 17, and U. 20. The following data show the number of cases of measles removed to hospital; and also the number of cases of measles or the number of deaths referred to measles in five of these seven districts during the periods over which removal of persons attacked by this disease to hospital has extended:—

District.	Period.	Number of Measles Cases or Deaths during Period.	Number of Cases of Measles removed to Hospital during Period.
U. 9 - - -	1883–94	335 deaths -	23
U. 10 - - - -	1882–94	1,907 *cases* -	139
U. 15 - - -	1882–92	633 deaths -	157
U. 16 - - -	1883–94	1,436 deaths -	69
U. 17 - - - -	1880–92	479 deaths -	35

In U. 10 the proportion of measles cases removed to hospital has been much more considerable in the four last years of the period in reference to which the above statistics are given than in earlier years of that period, as will be perceived from the following figures showing the number of known cases of measles in the district, and the number of cases of measles removed to hospital in each of these four years.

Year.	Number of Measles Cases known to have occurred in U. 10.	Number of these Measles Cases removed to Hospital.
1891	204	28
1892	48	10
1893	122	36
1894	320	45
1891–4	694	119

(4.) *Final Disinfection of Premises invaded by Measles.*—Premises known to have been invaded by measles are disinfected by the Sanitary Authority after conclusion of the infective period of the disease in all cases (save when the epidemic is so extensive as to have passed entirely beyond control) in the following six districts:—U. 5, U. 7, U. 8, U. 10, U. 15, U. 16. In nine districts the proportion of such disinfection is as follows:— In U. 13, about 75 per cent.; in U. 6, about 20 per cent.; in R. 9, 5 to 15 per cent.; in R. 3, "in almost all instances"; in U. 9, it is "hardly worth noting"; in U. 11, it is carried out "in malignant cases only"; in U. 12, it is carried out "laxly"; in R. 10, it is "not usual"; in R. 4, it has been resorted to "in one instance." Final disinfection is stated to be "rare" in the following eight districts:—U. 1, U. 2, U. 14, U. 17, U. 18, U. 20, U. 21, R. 7. In R. 5, R. 6, and R. 8, the Sanitary Authorities content themselves with advising the householders to perform disinfection, and have no certain knowledge as to the proportion of cases in which premises invaded by measles have been disinfected. Usually the process of disinfection consists of sulphur fumigation of the room or rooms occupied by the patient, followed by washings of woodwork and of infected articles of clothing: the sulphur fumigation being conducted by or under the supervision of an officer of the Sanitary Authority, and the subsequent washing by the occupier of the invaded premises. Lime-washing is in some instances resorted to after sulphur fumigation. In two districts only, namely. U. 5 and U. 7, infected bedding and other articles are habitually removed to the disinfecting station of the Sanitary Authority, and there exposed to treatment by high-pressure steam. In U. 10 this measure is resorted to when the invaded premises are used for purposes of a trade by which the disease is thought likely to be propagated.

3. MEASURES WHEREBY EXTENSION OF MEASLES THROUGHOUT THE INVADED DISTRICT MAY BE CHECKED.

(1.) *Information furnished by Sanitary Authorities to School Authorities regarding Occurrence of Measles.*

Information as to the existence of measles in a household is systematically furnished by the Sanitary Authority to the School Authorities of public elementary, private, and Sunday schools which may be found to be attended by a member or members of the invaded households in the following four districts:—U. 10, U. 14, R. 5, and R. 9. This information is furnished to the Authorities of public elementary and private schools, but not of Sunday schools in the following seven districts:—U. 7. U. 15, R. 4, R. 6, R. 7, R. 8, and R. 10. The like information is furnished solely to the Authorities of public elementary schools in the following seven districts:— U. 11, U. 12, U. 13, U. 20, R. 2, R. 3, and R. 11. No information of this sort is furnished by the Sanitary Authority to any of the School Authorities in the following 10 districts:—U. 1, U. 3. U. 4, U. 5, U. 6, U. 16, U. 17, U. 21, U. 22, and R. 1. In U. 2 it was the practice, at the date of my first visit, for the Sanitary Authority to inform the Authorities of public elementary and private schools of measles cases in households of which members attended these schools; but I found on the occasion of my second visit that this practice had ceased in consequence of strained relations between the Sanitary Authority and the School Authorities. In U. 8 the Sanitary Authority gives information to the Authorities of the public elementary schools in some instances but not in others, owing, it is stated, to the sanitary staff being not infrequently insufficient to cope with the work thus cast upon them. In U. 9, at the time of my first visit to this place, the Authorities of public elementary, private, and Sunday schools were systematically furnished by the Sanitary Authority with information as to households invaded by measles; but on my second visit I was informed that this information was no longer given "habitually." In U. 18 the Sanitary Authority, when measles has become epidemic, contents itself with the issue of a circular to the Authorities of public elementary schools informing them in general terms that this disease is epidemic in the district. In U. 19 the Sanitary Authority, during the period when voluntary notification was in force in the district, informed the Authorities of public elementary schools as to houses invaded by measles of which members attended school, but ceased to do so after voluntary notification had been dropped.

The manner in which this kind of information is given is, in the case of public elementary schools, either by written or verbal communication to the school board clerk or to the school attendance officer, or to the head master of the particular school attended by members of the household invaded by measles. As regards private schools, the information—verbal or written—is to the headmaster: and in the case of Sunday schools to the teachers. Specimens will be found in Addendum B. of forms of circular from Sanitary Authorities to school attendance officers and to headmasters and teachers.

(2.) *Exclusion of Members of Households invaded by Measles from School.*

In the 33 districts generally it is the practice of the visiting officer of the Sanitary Authority when he calls at a house invaded by measles to give instructions to the parents or guardians of children occupying the house that none of these children attend school until the premises be free from infection. There are, however, it will be remembered, four of these districts (U. 19, U. 22, R. 4, and R. 9) where such visits are paid either infrequently or not at all. In U. 19 this instruction was given during the period when voluntary notification of measles was in force in the district; but since the lapse of this system the Sanitary Authority gives no instructions to parents or guardians on this point. The School Board of this district, however, forbids attendance at school of children from households believed to be invaded by measles. In U. 22 these instructions are, at the request of the Sanitary Authority, given by the medical attendant (if any) in those instances where no officer of theirs visits the invaded household. In R. 4 no measures are taken to supplement the deficiency in instructions on this point consequent on the infrequency with which invaded households are visited by officers of the Sanitary Authority. In R. 9 the Sanitary Authority sends a printed notice containing these instructions to all houses known to be invaded by measles which are not visited by an officer of theirs.

In 15 districts the instructions are that children in houses invaded by measles are to be kept away from school for a number of weeks—varying from two to six—after the date of attack of the last case in the house.. These 15 districts are as follows:—U. 2, U. 7, U. 8, U. 9, U. 10, U. 12, U. 16. U. 17, U. 18, U. 19, U. 20, U. 22, R. 4, R. 5, R. 10. In two districts (U. 13 and U. 14) the instruction is that no child shall return to school from a dwelling in which measles has broken out without a medical certificate that the premises are free from infection. In U. 11, U. 21, R. 6, R. 8, and R. 9, the date at which children may return to school from a household known to have been invaded by measles is determined in some cases by a medical certificate, and in others by a time-limit. In U. 1, if no medical certificate be forthcoming, the opinion of the school attendance officer is accepted by the School Authorities. In U. 6 and R. 2 instruction is given by the Sanitary Authority that children be kept from school until, in the opinion of their medical attendant, all danger of infection is gone; but no certificate to this effect has to be produced to the School Authorities. In U. 15 the visiting officer of the Sanitary Authority gives instruction that children in the invaded house be kept away from school for a period of three weeks after the date of attack of the last case of measles in the family; and at the end of that time the Sanitary Authority sends a letter to the School Authorities intimating that children from the house in question may now safely return to school. A similar practice obtains in R. 6, where the time-limit is one of four weeks. In U. 5 instruction is given that children stay away from school until the invaded dwelling shall have been disinfected by the Sanitary Authority; whether this has been done or not is to be discovered by the school attendance officer making inquiry at the Health Office. If he fail to do this (as is said sometimes to happen), a statement made by the children on their return to school that disinfection has been performed is accepted. In U. 3, U. 4, R. 1, and R. 7, instruction is given by the visiting officer of the Sanitary Authority that children in the invaded house be kept away from school; but no information is afforded by him as to when return to school will be permissible. In R. 11 the practice in this respect varies according to whether the households invaded by measles are few or whether the disease has passed beyond the control of the Sanitary Authority's staff. In the latter case nothing is done; in the former case attendance at school is forbidden, not merely of children in the invaded household, but also, in some instances, of children in neighbouring houses. This prohibition is continued until the Medical Officer of Health—either verbally or by letter—informs the School Authorities that the children thus debarred from attendance at school may with safety be re-admitted.

In most of the 33 districts the School Authorities would seem to aid the Sanitary Authority in securing observance of the instructions set forth as given in each. But in U. 2, U. 5, U. 8, R. 3, and R. 6, I was informed that occasionally, and more especially when school examinations were pending, the School Authorities press for return of children residing in houses invaded by measles before, in the opinion of the Sanitary Authority, this course is advisable or safe. In U. 2, U. 5, and R. 3, particular objection is taken by the officers of the Sanitary Authority to a practice sometimes indulged in in these districts, whereby a schoolmaster or schoolmistress sends children from school to make inquiry at houses invaded by measles as to whether children from these houses are not yet ready to return to school, thus exposing the messengers so sent to risk of contracting the disease themselves.

In Addendum B. will be found forms employed by Sanitary Authorities in connection with the measures dealt with under this heading.

(3.) *School Closure.*

In 24 out of the 33 districts visited, closure by the Sanitary Authority, either of particular schools, among the children attending which measles had broken out, or of all or of the majority of the schools in the district, has been resorted to with a view to checking spread of the disease. The remaining nine districts, in which school closure has not received trial at any time, are the following:—U. 3, U. 6, U. 9, U. 16, U. 17, U. 18, U. 19, U. 20, R. 1.

In 21 out of these 24 districts school closure was, as regards public elementary schools, effected by the Sanitary Authority in virtue of powers under Article 88 of the Code of Regulations approved by the Lords of the Committee of Council on Education. In such of these 21 districts as the closure of Sunday schools or private schools—to which Article 88 of the

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Education Code does not apply—was from time to time resorted to, the procedure adopted to this end consisted of request made by the Sanitary Authority to the Managers of these schools to close them. In Addendum B. will be found a form of letter used by one of these Sanitary Authorities for this purpose. In three districts (U. 2, U. 8, and U. 12) the Sanitary Authority has power to close private schools as well as public elementary schools by virtue of provisions contained in local Acts; while in one of these three districts (U. 2) the Sanitary Authority has the still more extended power of ordering "public or private day schools or other places "of public resort situated in neighbourhoods threatened with or affected "by any dangerous epidemic or infectious disease to be temporarily closed "or suspended." In the majority of instances in which school closure has been resorted to in these 24 districts, it has been usual to close the whole school; but trial has also been made of closure of the infant departments only on sundry occasions in the following districts:—U. 2, U. 5, U. 7, U. 8, U. 15, R. 3.

In many of the districts in which trial has been made of school closure in one or another form, data on which estimate could be based as to the probable effect, or want of effect, of school closure in the way of checking spread of measles, were either wanting or were not available in form serviceable for this purpose. In a few districts, however, the facts and figures bearing on this subject were found to be sufficiently full to merit detailed consideration, and I proceed to furnish information obtained with reference to the principal instances of this sort, specifying in each case the district from which the particular experience is selected.

School Closure in U. 2.

In 1889, on account of an epidemic of measles then prevailing in the district, the infant department of a school which I shall term school A. was closed from April 4th to May 2nd; on May 24th all the departments of another school (school B.) were closed; and on June 7th all public elementary schools (10), all private day schools, and the infant departments of all Sunday schools (18) in the district were closed for a period of five weeks. The following list shows the number of cases of measles that came to the knowledge of the Sanitary Authority from February 1889 to August 1889.

During the week ending:—

		Cases.		
March	14	0		
,,	21	2		
,,	28	0		
April	4	14	Infant department of school A. closed April 4 to May 2.	
,,	11	11		
,,	18	32		
,,	25	21		
May	2	40		
,,	9	49		
,,	16	35		
,,	23	64		
,,	30	49	School B. closed May 24 to July 11.	
June	6	66		
,,	13	33		All day schools and infant departments of all Sunday schools closed June 7 to July 11.
,,	20	47		
,,	27	33		
July	4	23		
,,	11	4		
,,	18	3		
,,	25	0		

As result of the closure of the infant department of school A., there was, according to the Medical Officer of Health for the district, almost entire disappearance, 14 days after this step was taken, of measles among children on the books of this school. A similar result is stated to have

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followed within the like period on closure of school B., as regards children attending that school. No material decrease, however, of measles in the district appears to have ensued on closure of either of these schools. The closure of all day schools, and of infant departments of Sunday schools, on June 7th was followed by a marked decrease in prevalence of the disease, and its entire disappearance shortly afterwards; this marked decrease ensuing some four weeks after schools were closed, and being, it will be observed, not inconsistent with influence of season.

Owing to prevalence of measles in the same district in the latter part of 1891, the infant departments of two public day schools were closed from November 12th, 1891, to January 10th, 1892; and the infant departments of all public elementary schools (10) were closed from December 10th, 1891, to January 10th, 1892. The following list shows the number of cases of measles that came to the knowledge of the Sanitary Authority from mid-October 1891 to the end of February 1892:—

During the week ending—

		Cases.
Oct.	15	0
,,	22	4
,,	29	10
Nov.	5	19
,,	12	44
,,	19	69
,,	26	60
Dec.	3	63
,,	10	46
,,	17	42
,,	24	63
,,	31	41
Jan.	7	24
,,	14	25
,,	21	17
,,	28	9
Feb.	4	7
,,	11	9
,,	18	3
,,	25	2

Infant departments of two public day schools closed November 12–January 10.

Infant departments of all public day schools closed December 10–January 10.

It will be observed that closure of the infant departments of the two schools first dealt with in this way was not followed by reduction of the number of known cases of measles, while material decrease of the amount of the disease appears to have ensued in the course of the fourth week after closure of infant departments of all day schools on December 10th. This decrease, it may be noted, is not inconsistent with influence of season.

Measles again became prevalent in the district in the spring of 1892, and persisted during the greater part of the remainder of that year. In consequence the following schools were, at one or another time, closed by the Sanitary Authority:—On June 8th the infant department of school A. for one month, and the whole of school B. for the same period. All public elementary schools (10) closed for the summer holidays from June 17th to July 25th. On August 19th the infant department of school C. was closed for two months. On September 26th the infant department of school D. was closed for two months. On October 14th the infant department of school E. was closed for six weeks. The disease appears to have almost disappeared from the district during December 1892 and early January 1893, but in later January there was some recrudescence of measles, and on this account all the departments of another school were closed on January 26th for one month, and also a Sunday school for five Sundays. The following list shows the number of known cases of measles from the beginning of April 1892 to the middle of March 1893:—

During the week ending—

		Cases.	
April	7	1	
,,	14	6	
,,	21	7	
,,	28	19	
May	5	13	
,,	12	44	
,,	19	13	
,,	26	45	
June	2	36	
,,	9	51	Closure of infant department of school A. and whole of school B. from June 8 to July 8.
,,	16	42	All public elementary schools closed for summer holidays June 17—July 25.
,,	23	64	
,,	30	59	
July	7	14	
,,	14	50	
,,	21	28	
,,	28	21	
Aug.	4	20	
,,	11	15	
,,	18	10	Closure of infant department of school C., Aug. 17—Oct. 17.
,,	25	47	
Sept.	1	29	
,,	8	54	
,,	15	38	
,,	22	42	
,,	29	44	Closure of infant department of school D., Sept. 26—Nov. 26.
Oct.	6	54	
,,	13	53	
,,	20	62	Closure of infant department of school E., Oct. 14—Nov. 26.
,,	27	53	
Nov.	3	13	
,,	10	17	
,,	17	7	
,,	24	2	
Dec.	1	4	
,,	8	0	
,,	15	3	
,,	22	1	
,,	29	1	
Jan.	5	1	
,,	12	0	
,,	19	0	
,,	26	12	
Feb.	2	18	Closure of whole school F., Jan. 26—Feb. 26. Closure of a Sunday school for five Sundays.
,,	9	15	
,,	16	2	
,,	23	3	
March	2	2	
,,	9	0	
,,	16	0	

As regards closure of schools in June 1892, it appears that material reduction in the number of known cases of measles did not occur until some six weeks after closure of the infant department of school A. and the whole of school B., nor until some five weeks after closure of all public elementary schools in the district for the summer holidays. As regards school closure in autumn of the same year, material reduction in the number of known cases of measles followed ten weeks after closure of the infant department of school C., four weeks after closure of the infant department of school D., and two weeks after closure of the infant department of school C.

The closure of school F. and accompanying closure of a Sunday school on January 26th, 1893 were followed by a marked decrease of known measles cases within a fortnight of closure, and by rapid disappearance of the disease from the district.

Measles reappeared in epidemic form in this district in the autumn of 1893, and, as a consequence, the following schools were closed by the Sanitary Authority:—Infant department of school A., on August 28th, for one month; infant department of school B., from October 12th to November 26th; infant department of school C., on November 20th, for one month; infant department of school D., on November 30th, for one month. The following list gives the number of cases of measles that came to the knowledge of the Sanitary Authority from the commencement of August 1893 to the latter part of February 1894:—

During the week ending:—

		Cases.	
Aug.	3	3	
"	10	6	
"	17	4	
"	24	2	
"	31	13	Closure of infant department of school A., Aug. 28—Sept. 28.
Sept.	7	13	
"	14	16	
"	21	10	
"	28	9	
Oct.	5	4	
"	12	15	
"	19	29	Closure of infant department of school B., Oct. 12—Nov. 26.
"	26	73	
Nov.	2	30	
"	9	100	
"	16	88	
"	23	55	Closure of infant department of school C., Nov. 20—Dec. 20.
"	30	73	
Dec.	7	44	Closure of infant department of school D., Nov. 30—Dec. 30.
"	14	92	
"	21	48	
"	28	25	
Jan.	4	25	
"	11	6	
"	18	7	
"	25	2	
Feb.	1	3	
"	8	2	
"	15	1	
"	22	1	

There was, it will be noticed, some decrease in the number of known cases of measles in this district subsequent to the closure of the infant department of school A. on August 28th; but this decrease did not long continue, and from mid-October to mid-December the number of cases was very high, and does not appear to have been affected by the successive closure of the infant departments of schools B., C., and D. Towards the end of December the epidemic began to wane, and was almost over in early January.

School Closure in U. 5.

In February 1892 measles became prevalent in a portion of this district, and thereupon the Sanitary Authority closed a public elementary school in the invaded neighbourhood for 17 days. The following list gives the number of cases of measles that came to the knowledge of the Sanitary Authority from the end of January to early April:—

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During the week ending—

		Cases.	
Jan.	29	1	
Feb.	5	0	
,,	12	4	
,,	19	27	
,,	26	17	
March	4	33	
,,	11	17	School closed March 4–21.
,,	18	15	
,,	25	10	
April	1	3	
,,	8	2	
,,	15	2	

In October 1893, measles having become prevalent in another part of the district, the Sanitary Authority closed the infant department of a school in the invaded neighbourhood for a fortnight. The usual data as to number of known cases are to be found in the following list:—

During the week ending—

		Cases.	
Sept.	12	0	
,,	19	0	
,,	26	12	
Oct.	3	1	
,,	10	7	
,,	17	8	
,,	24	25	Infant department of school closed Oct. 17—Nov. 1.
,,	31	6	
Nov.	7	1	
,,	14	2	
,,	21	0	
,,	28	0	

As regards the closure of a school in this district in March 1892, it will be observed that decrease in the number of known cases of measles commenced about a week after the date on which this school was closed, and that the disease seems to have almost entirely disappeared from the district in about three weeks from this date. There were 450 children on the rolls of the school, and the average attendance during the week ending February 5th, after which date measles became markedly prevalent among the pupils, was 346.

As regards closure of the infant department of a school on October 17th, 1893, it appears that in this instance also decrease of known cases of measles commenced about a week after closure, while the disease seems to have almost entirely disappeared from the district by the third week after this measure had been adopted. There were 114 infants on the rolls of this school. During the month of September the average attendance of infants was 84; but this average probably is to be regarded as having been affected by measles, which in that month appeared among the infants attending the school.

In both of these instances, it will be observed, decline of measles-prevalence had begun to manifest itself at a date which renders the influence of this measure on the course of the outbreak somewhat doubtful.

School Closure in U. 7.

In 1891, measles being very prevalent in this district, the Sanitary Authority made trial of school closure with a view to checking spread of the epidemic. On March 28th the infant department of a particular school in the district was closed until July; and on May 15th all public elementary schools (12) in the district were closed for one month. The Sanitary Authority also, on taking the latter step, issued a circular to the managers of all private and Sunday schools in the district asking them to close their schools for the same period; but this request was complied with in a few instances only. Further, the infant departments of the public elementary schools were kept closed for four additional weeks after June 13th, the date on which the other departments of public elementary schools were permitted to re-open.

Unfortunately, no trustworthy data as to the amount of measles prevalence, are available anterior to March 14th, when compulsory notification of measles came into operation in the district. The disease, however, had been very prevalent in the district for some weeks anterior to the date referred to.

During the week ending—

		Cases.	
March	21	40	
,,	28	53	
April	4	45	Closure of infant department of a particular school, March 28—July 11.
,,	11	46	
,,	18	55	
,,	25	50	
May	2	51	
,,	9	54	
,,	16	36	Closure of all public elementary schools (and a few private and Sunday schools), May 15—June 13.
,,	23	64	
,,	30	44	
June	6	48	
,,	13	41	Continuance of closure of infant departments of public elementary schools, June 13—July 11.
,,	20	44	
,,	27	19	
July	4	23	
,,	11	6	
,,	18	11	
,,	25	3	

In this district, it will be observed, neither the closure of the infant department of a particular public elementary school on March 28th nor the subsequent closure on May 15th of all public elementary schools, as well as of a few private and Sunday schools, was followed by any early abatement of the epidemic, which gave no indication of waning until the end of June.

School Closure in U. 12

In 1889, during a period of measles prevalence in part of this district, all infant departments of public elementary schools and all Sunday schools in the invaded neighbourhood were closed for three weeks. The data furnished as regards number of known measles cases are grouped in monthly instead of weekly periods, which renders it difficult to estimate what may have been the effect of school closure on the epidemic. These data are as follows:—

	Cases.	
During April - -	6	
,, May - - -	163	Closure of infant schools and Sunday schools, May 27—June 17.
,, June - -	107	
,, July - - -	43	
,, August - -	11	
,, September - -	6	

In this instance school closure would seem to have been followed by considerable decrease of measles prevalence at a season usual for decline of measles; but the monthly grouping of cases does not indicate clearly how soon this decrease ensued.

In this district, in 1890, during an epidemic of measles, school closure was resorted to as follows:—All the departments of one school were closed from Oct. 17 to Nov. 24, and of another from Nov. 3 to Nov. 24; while, at the same time, most of the Sunday schools in the same neighbourhood as these two week-day schools were also closed. The infant departments of two other public elementary schools were closed from the 24th and 27th November respectively until mid-January of the following year (1891); and yet another mixed school was closed from March 20th, 1891, for three weeks. The following were the measles cases that came to the knowledge of the Sanitary Authority from August, 1890, to July, 1891:—

		Cases.	
1890.	August	2	
	September	32	
	October	244	One school closed Oct. 17—Nov. 24. A second school closed Nov. 3—Nov. 24. Most Sunday schools closed Nov. 3—Nov. 24.
	November	352	Two infant schools closed from Nov. 24 and 27 to middle of January.
	December	435	
1891.	January	217	
	February	139	
	March	173	A third school closed from March 20—April 10.
	April	100	
	May	26	
	June	6	
	July	2	

So far as judgment is possible from figures given in monthly groups, it would not appear that the school closure in October and November, 1890, was followed by decrease of measles-prevalence that could definitely be referred to the action taken. It is difficult to draw any inference as regards the influence of closure of a particular school in March 1891.

School Closure in U. 14.

In this district measles was prevalent during the spring and early summer of 1892. Prior to July 23rd, the date on which public elementary schools (3) in the district closed for the annual summer holiday period, the prevalence had been small but constant. In the week, however, when the schools closed, there was a sudden rise in the amount of the disease, and the number of cases remained so high that, at the instance of the Sanitary Authority, the ordinary holiday was prolonged for one week, the schools re-opening not on August 23rd, but on August 30th. All Sunday schools (12) were also closed from July 23rd to August 30th. I append a list of measles cases that came to the knowledge of the Sanitary Authority from the beginning of May to mid-December:—

During the week ending:—

		Cases.	
May	7	0	
,,	14	1	
,,	21	0	
,,	28	2	
June	4	2	
,,	11	2	
,,	18	2	
,,	25	2	
July	2	1	
,,	9	4	
,,	16	0	
,,	23	24	
,,	30	35	All public elementary and Sunday schools closed July 23—Aug. 30.
Aug.	6	30	
,,	13	22	
,,	20	27	
,,	27	12	
Sept.	3	14	
,,	10	12	
,,	17	6	
,,	24	35	
Oct.	1	13	
,,	8	31	
,,	15	35	
,,	22	33	
,,	29	79	
Nov.	5	15	
,,	12	32	
,,	19	12	
,,	26	21	
Dec.	3	8	
,,	10	11	
,,	17	3	

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It appears from these figures that there was in the third and fourth weeks after closure of the schools a slight decrease in the number of known measles cases, followed by a material decrease in the fifth, sixth, seventh, and eighth weeks. In the ninth week there was again a sudden rise in the number of cases, and it is noteworthy that the beginning of this week is 19 days after the re-opening of the schools took place. The number of cases remained high until mid-November, when the epidemic began to wane, and by mid-December the cases had fallen to three in one week. School closure was not resorted after the month of August.

School Closure in R. 5.

In the beginning of 1892 measles made its appearance in this district in an area comprising two nearly adjacent villages. The population of the invaded neighbourhood is about 1,200. The two villages and the remainder of the area are served by a single public elementary school. This school, as well as the Sunday schools in the invaded neighbourhood, was closed from January 29th to February 22nd. The following list shows the number of known measles cases in the area in question from the beginning of January to the end of March.

During the week ending—

		Cases.	
Jan.	7	0	
,,	14	0	
,,	21	2	
,,	28	3	
Feb.	4	13	All schools in the neighbourhood closed Jan. 29—Feb. 22.
,,	11	20	
,,	18	22	
,,	25	22	
March	4	5	
,,	11	2	
,,	18	2	
,,	25	0	
April	1	1	
Total number of cases.		92	

In this instance, it will be noted, decrease of the number of known cases of measles did not commence until some four weeks after closure of the schools of the invaded neighbourhood. The decrease, when it did begin, was very marked, and was followed by rapid disappearance of the disease from the neighbourhood. Nearly 8 per cent. of the total population of the invaded area are known to have been attacked by measles in the course of this outbreak.

In the latter part of the same year measles made its appearance in another part of the district, and in this instance affected two contiguous areas. One of these areas, which I shall term A., has a population of nearly 1,700; the other, which will be referred to as B., has a population slightly over 200. Each area has its own public elementary school. In A. this school and all Sunday schools were closed from December 1st, 1892, to January 16th, 1893; in B., where measles appeared rather later than in A., the public elementary school and the Sunday schools were closed from December 29th, 1892, to January 23rd, 1893. The following list gives the number of known cases of measles in these two areas from early November to the end of January :—

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During the week ending—

		Cases.	
Nov.	11	1	
,,	18	1	
,,	25	4	
Dec.	2	10	
,,	9	15	Closure of all schools in A., Dec. 1—Jan. 16.
,,	16	18	
,,	23	16	
,,	30	10	Closure of all schools in B., Dec. 29—Jan. 23.
Jan.	7	9	
,,	14	1	
,,	21	0	
,,	28	0	
Total	-	85	

From these figures it appears that decrease of known cases of measles began some three weeks after closure of schools in A.; and was followed by disappearance of the disease two weeks after closure of the schools in B. It was found impossible at the date of my visit to satisfactorily distinguish whether A. or B. schools were attended by some of the cases, and in consequence the figures for the two invaded areas are grouped as above. Since, however, measles is known to have made its appearance in area B. in late December, it may with justice be assumed that a considerable number of the December cases in the above list belonged rather to B. area than to A., and that the decrease in number of known cases in area A. subsequent to school closure was more rapid than appears from the above figures. About 4½ per cent. of the total population of the two areas are known to have been attacked in the course of this outbreak.

In the beginning of 1893 measles broke out in the same district in a locality with a population of about 420. The public elementary school and the Sunday schools serving the invaded area were closed from January 16th to February 11th. I append the weekly list of known measles cases:—

During the week ending—

		Cases.	
Jan.	3	0	
,,	10	0	
,,	17	2	
,,	24	40	All schools closed Jan. 16—Feb. 11.
,,	31	16	
Feb.	7	11	
,,	14	7	
,,	21	1	
,,	28	0	
March	7	0	
,,	14	3	
,,	21	0	
,,	28	0	
Total	-	80	

In this instance it will be observed that there was rapid decrease in the number of known cases of measles as early as in the course of the second week after school closure, with subsequent rapid disappearance of the disease. It is also noteworthy that over 19 per cent., or about one-fifth of the total population of the invaded neighbourhood, are known to have been attacked in the course of this outbreak. It is a question, therefore, whether the human material in this neighbourhood susceptible to attack by measles may not have become exhausted.

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In the spring of 1894 measles appeared in the same Rural district in two adjacent areas, C. and D., of which C., with a population of over 900, was first invaded. D., with a population of over 700, was invaded within two or three weeks of C. Each district has its own public elementary school. That serving C., as well as the Sunday schools in that neighbourhood, was closed from April 30th to May 28th. In D. the public elementary school and the Sunday schools serving this neighbourhood were closed from May 23rd to June 25th. The following is the list of known cases of measles in these areas from the beginning of March to the end of July:—

During the week ending—

		Cases.	
March	7	0	
,,	14	0	
,,	21	2	
,,	28	0	
April	4	1	
,,	11	0	
,,	18	1	
,,	25	0	
May	2	19	Closure of all schools in C., April 30—May 28.
,,	9	22	
,,	16	37	
,,	23	22	
,,	30	13	Closure of all schools in D., May 23—June 25.
June	6	37	
,,	13	11	
,,	20	9	
,,	27	2	
July	4	4	
,,	11	1	
,,	18	3	
,,	25	0	
Aug.	1	0	
Total	-	184	

As in the outbreak in another part of this district in the latter part of 1892, it was found impracticable to differentiate satisfactorily in every instance the schools attended by the persons attacked, and therefore the number of cases in the two areas are grouped together, a procedure which necessarily increases the difficulty of judging what may have been the effect of closing the schools in each of those areas. School closure in C. was not, taking the two areas together, followed by reduction in the number of known measles cases until some three or four weeks later; but in the case of D. decrease of measles appears to have ensued after the schools had been closed two weeks. This decrease, it will be observed, is not inconsistent with influence of season. About 11 per cent. of the total population of the two areas were attacked by measles in the course of this outbreak.

School Closure in R. 6.

Measles made its appearance in this district in September 1894, and in consequence the Sanitary Authority closed the public elementary school serving the invaded area from October 3rd until November 14th; a private school situated in the invaded area was also closed from October 23rd to November 28th. The population of the invaded area is about 3,800. The following list shows the number of cases of measles that came to the knowledge of the Sanitary Authority from the latter part of September to the end of December:—

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During the week ending—

		Cases.	
Sept.	29	3	
Oct.	6	21	
„	13	70	
„	20	53	
„	27	44	Public elementary school closed Oct. 3—Nov. 14.
Nov.	3	26	
„	10	12	Private school closed Oct. 23—Nov. 28.
„	17	7	
„	24	5	
Dec.	1	1	
„	8	0	
„	15	1	
„	22	1	
„	29	3	
Total	-	247	

In this instance it will be observed that decrease in the number of known cases of measles occurred some four weeks after closure of the public elementary school. From 6 to 7 per cent. of the total population are known to have been attacked by measles in the course of this outbreak.

School Closure in R. 9.

In this district measles made its appearance in May 1891 in a hamlet with a population of about 800. In consequence the Sanitary Authority closed the public elementary school that served the invaded neighbourhood from June 4th to June 18th. The Sunday schools were closed during the same period. The following is a list of the cases that came to the knowledge of the Sanitary Authority from the beginning of May to the end of June:—

During the week ending—

		Cases.	
May	4	0	
„	11	1	
„	18	4	
„	25	7	
June	1	7	
„	8	4	Day and Sunday schools closed June 4–18.
„	15	20	
„	22	4	
„	29	0	
July	6	0	
Total	-	47	

From the above figures it appears that school closure was followed within two weeks by rapid decrease of known cases of measles and early disappearance of the disease from the locality. It has to be noted, however, that it was in the month of June that this sudden decline of measles took place. Some 5 or 6 per cent. of the total population are known to have been attacked in the course of this outbreak.

In October of the same year measles broke out in another part of the district. The invaded area has a population of nearly 2,700. On account of this outbreak the public elementary school serving this neighbourhood was closed from November 17th to December 1st; and again from December 15th to 29th. The Sunday schools were also closed during these periods. The following list shows the number of cases of measles that came to the knowledge of the Sanitary Authority from mid-October to mid-January:—

During the week ending—

		Cases.	
Oct.	15	0	
,,	22	1	
,,	29	1	
Nov.	5	6	
,,	12	8	
,,	19	34	Day and Sunday schools closed Nov. 17—Dec. 1.
,,	26	51	
Dec.	3	21	
,,	10	19	
,,	17	4	Schools again closed Dec. 15–29.
,,	24	4	
,,	31	1	
Jan.	7	3	
,,	14	0	
Total		- 153	

In this instance decrease of measles became apparent within two weeks of the school closure of November 17th. By December 15th, when the schools were closed a second time, the known cases of measles had become few, and the disease soon afterwards disappeared from the locality. Close upon 6 per cent. of the total population are known to have been attacked by measles in the course of this outbreak.

In 1894 measles again assumed epidemic proportions in the district. In November of that year measles broke out in a hamlet with a population of about 1,000, and in consequence the Sanitary Authority closed the public elementary school serving the neighbourhood from December 13th to 27th. The Sunday schools were also closed during this period. The following is a list of known cases of measles from the latter part of October to the beginning of February:—

During the week ending—

		Cases.	
Oct.	29	0	
Nov.	5	1	
,,	12	0	
,,	19	2	
,,	26	0	
Dec.	3	1	
,,	10	32	
,,	17	32	Day and Sunday schools closed Dec. 13—27.
,,	24	44	
,,	31	17	
Jan.	7	0	
,,	14	3	
,,	21	1	
,,	28	0	
Feb.	4	0	
Total		- 133	

In this instance decrease of known cases of measles in the invaded area followed some two weeks after closure of the schools. It is to be noted that 13 per cent. of the population are known to have been attacked by measles in the course of the outbreak, and that it was in December that decline of the disease occurred.

In November of the same year measles became epidemic in another part of the district, that has a population of slightly over 2,000. The public elementary schools and the Sunday schools serving the invaded locality were closed from December 15th to 29th.

I append a list of the known cases of measles from September 1894 to the end of January 1895:—

During the week ending—

		Cases.	
Sept.	3	1	
"	10	0	
"	17	0	
"	24	0	
Oct.	1	0	
"	8	1	
"	15	0	
"	22	0	
"	29	1	
Nov.	5	2	
"	12	19	
"	19	4	
"	26	15	
Dec.	3	9	
"	10	16	
"	17	10	Day and Sunday schools closed Dec. 15—29.
"	24	15	
"	31	6	
Jan.	7	3	
"	14	0	
"	21	2	
"	28	0	
Total	-	104	

It appears from these figures that school closure was followed within two weeks by material decrease in the number of cases of measles known to Sanitary Authority, and that soon afterwards the disease disappeared from the neighbourhood. About 5 per cent. of the total population of the invaded area were attacked in the course of the outbreak.

In January 1895 measles made its appearance in this district in a hamlet (already cited as having been invaded in May 1891) with a population of about 800. The public elementary school serving the place and the Sunday schools were closed from February 15th to March 1st. The following is a list of the cases of measles that came to the knowledge of the Sanitary Authority from the beginning of January to the end of March:—

During the week ending—

		Cases.	
Jan.	7	0	
"	14	2	
"	21	5	
"	28	1	
Feb.	4	1	
"	11	4	
"	18	4	Day and Sunday schools closed Feb. 15—March 1.
"	25	5	
March	4	4	
"	11	0	
"	18	0	
"	25	0	
Total	-	26	

In this instance closure of the schools was followed in less than three weeks by entire disappearance of measles from the neighbourhood, so far as known to the Sanitary Authority. About 3 per cent. of the total population is known to have been attacked in the course of this outbreak.

School Closure in R. 10.

In 1894 measles made its appearance in this district, invading in the month of July an area with a population of nearly 3,200. The Sanitary Authority closed the public elementary school serving the invaded

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neighbourhood from September 21st to October 15th. I append a list of the measles cases that came to the knowledge of the Sanitary Authority from the beginning of July to the end of November:—

During the week ending—

		Cases.	
July	7	1	
,,	14	1	
,,	21	0	
,,	28	1	
Aug.	4	4	
,,	11	4	
,,	18	0	
,,	25	2	
Sept.	1	0	
,,	8	9	
,,	15	11	
,,	22	28	School closed Sept. 21—Oct. 15.
,,	29	13	
Oct.	6	8	
,,	13	10	
,,	20	1	
,,	27	1	
Nov.	3	3	
,,	10	0	
,,	17	0	
,,	24	1	
Dec.	1	0	
Total -		98	

In this instance it will be observed that decided decrease in the number of known cases of measles took place some three weeks after closure of the school. Rather more than 3 per cent. of the total population are known to have been attacked in the course of this outbreak.

In July of the same year measles appeared in another part of this district, of which the population is nearly 1,900. In this neighbourhood the disease, after smouldering during August and nearly disappearing in September, assumed epidemic proportions towards the latter part of October. The Sanitary Authority closed the public elementary school serving the invaded area from October 18th to November 19th. I append a list of cases of measles that came to the knowledge of the Sanitary Authority from the latter part of July to mid-December:—

During the week ending—

		Cases.	
July	30	3	
Aug.	6		
,,	13	2	
,,	20	3	
,,	27	0	
Sept.	3	2	
,,	10	1	
,,	17	0	
,,	24	0	
Oct.	1	0	
,,	8	1	
,,	15	3	
,,	22	24	School closed Oct. 18—Nov. 19.
,,	29	21	
Nov.	5	10	
,,	12	10	
,	19	11	
,,	26	5	
Dec.	3	4	
,,	10	0	
,,	17	0	
Total -		106	

In this instance there is seen to have been material decrease in the number of known cases of measles in the course of the third week following closure of the school. This decrease continued, and the disease disappeared from the locality about seven weeks after closure of the school, and two weeks after its re-opening. From 5 to 6 per cent. of the population are known to have been attacked by measles in the course of this outbreak.

(4.) *Other Measures adopted by Sanitary Authorities with a view to preventing spread of Measles throughout their Districts.*

(*a.*) *Precautions against dissemination of Measles by means of books lent from Public Libraries.*—In several of the districts visited by me there are public libraries, and in five of these districts the following measures are resorted to with a view to preventing books issued from these libraries becoming a means of further propagation of measles. In U. 5 the chief librarian of the public library is furnished by the Public Health Department with the name and address of each person known to the Sanitary Authority to be suffering from measles; whereupon no further books are supplied from the public library to persons living at that address until a further notice has been received from the Public Health Department that the house has been disinfected. In U. 8 notice is in like manner sent by the Health Department to the public librarian requesting him not to issue books to certain specified houses (invaded by measles) until he shall have received further notice intimating that books may again be issued to these houses: and until receipt of this second notice issue of books to these houses is suspended. In U. 10, in addition to similar precautions, the public librarian is requested to forward immediately for disinfection to the Medical Officer of Health "with all proper "precautions, any book which may be returned by a borrower inhabiting" a house notified by the Health Department to the public librarian as invaded by measles. In U. 13 the public librarian is informed by the Sanitary Authority of the names and addresses of all persons known to be suffering from measles, and issues no books to persons residing at these houses until furnished with a medical certificate as to their having become free from infection. In U. 15 the Sanitary Authority sends the public librarian a list of houses invaded by measles, but sends no second list specifying when these houses have become free from infection. This latter knowledge is acquired through personal inquiry made at the Health Office by the staff of the free library. In several districts it is the practice to send free library books that have been discovered in measles-invaded households to the district hospital for infectious disease, for the use of patients there. Copies of circular forms sent by Sanitary Authorities to public librarians will be found in Addendum B.

(*b.*) *Prohibition of Persons residing in households invaded by Measles from attendance at their Work.*—In many of the districts visited by me persons residing in houses invaded by measles are not on that account instructed by the Sanitary Authority to abstain from their work, of whatever sort it may be. But in the following districts this instruction is given in some instances:—U. 7, U. 8, U. 10, U. 12, U. 15, U. 16, U. 17, U. 20, R. 6, R. 7, R. 9. The extent to which this advice is given varies in the several districts referred to. It is usually given only when the occupation is of sort considered likely to further propagation of measles; such, for example, as hawking, milk selling, teaching in school, tailoring. In U. 10, where a considerable proportion of measles cases are removed to hospital, prohibition of residents in the invaded house from attendance at their work is resorted to to a greater extent than in any other district visited by me. In this district it is, in fact, frequently insisted upon as an alternative to removal of the child attacked by measles to hospital, and as not a few persons prefer the latter to the former alternative, the Sanitary Authority is in this way able to obtain consent to the removal to hospital of cases that would otherwise be treated at home.

(*c.*) *Instruction of the public as regards Measles.*—In addition to instruction given by visiting officers of the Sanitary Authority or contained in bills left by these officers at houses invaded by measles, efforts in other ways to impress upon the public the serious nature of this malady have been made by the Sanitary Authorities of the following districts, namely, U. 1, U. 7, U. 8, R. 5, R. 6, and R. 10. Thus, in U. 1 a card containing instructions regarding infectious disease—especially scarlet fever and measles—was, in 1891, issued by the Sanitary Authority to all children attending school, the schoolmasters being requested to give one to each child, with instructions to take it home to his parents or guardians. The card was provided with a hook, by means of which it could be hung up on the wall. In the same district it has been the practice of the Sanitary Authority for some time to issue every year a circular regarding the management of infants and young children. This circular mainly has reference to diarrhœa, but contains also instructions regarding infectious diseases, including measles. It is distributed by registrars of births, who present one to each person that registers a birth. In U. 7 during an epidemic of measles in the district in 1885 the Sanitary Authority caused to be distributed from house to house a bill containing a warning that measles was prevalent in the locality, and giving instructions as to measures to be taken in the event of measles appearing in the house. In U. 8 a calendar was issued by the Sanitary Authority in 1891, which, in addition to giving the usual chronological data and being embellished with pictures, embodied instructions for the prevention of disease, one paragraph being devoted to measles. This calendar was distributed from house to house throughout the district. In R. 6, measles having, in 1894, become prevalent in one of the parishes in that district, the Sanitary Authority distributed, through the medium of the schools, a leaflet in which warning was given as to the local prevalence of measles and as to the dangerous nature of this disease. It also indicated precautions to be taken against attack, and measures to be adopted should measles break out in the household. This leaflet was distributed throughout all the parishes in the district, save that in which measles was actually prevalent. In R. 5 and R. 10 the Sanitary Authorities cause the neighbourhood of dwellings invaded by measles to be placarded with bills setting forth the dangerous nature of the disease and the steps to be taken by the householder in the event of its invading his dwelling. In Addendum B. will be found specimens of some of the circulars and bills referred to under this heading.

(*d.*) *Sufficiency of Sanitary Staff.*—When a measles epidemic is widespread and cases are very numerous the ordinary staff of the invaded district, even if it be well equipped in this respect, may be found insufficient to deal with the outbreak. But in many of the districts visited by me the sanitary staff cannot be considered as sufficient for the duties incumbent on them even in times when measles is not epidemic. These districts are the following:—U. 2, U. 3, U. 6, U. 7, U. 9, U. 12, U. 14, U. 17, U. 19, R. 1, R. 2, R. 5, R. 7, R. 8, R. 10, and R. 11.

ADDENDUM B.

Information furnished by School Authorities to the Sanitary Authority regarding Occurrence of Measles.

Form employed in U. 15.

Confidential.

The Medical Officer of Health will be obliged if the head teacher will supply him with a list of absentees, the cause of whose absence is suspected to be some infectious ailment.

N.B.—Only cases in which there is reasonable ground to suspect that the cause of absence is infectious disease should be put in this list.

School . Department .

Name.	Address.	Suspected Nature of Illness.	Class in the School.

*** The sanitary inspector will call weekly—on Friday morning—when it is hoped the list will be ready.

Forms employed in U. 21.

School,
Department,
18 .

INFECTIOUS DISEASES.

Notice is hereby given that , residing at , has this day been excluded from school for the following reason :

Head Teacher.

To the Medical Officer of Health.

No. . 189 .

To the Medical Officer of Health.
residing at is suffering from .

School Attendance Officer.

Information furnished by Sanitary Authorities to School Authorities regarding Occurrence of Measles.

Forms employed in U. 15.

Sanitary Department,
Town Hall,
, 189 .

List of cases of infectious disease during the week ending
for the use of the head teacher of School.

Private and Confidential.

Name.	Address.

Medical Officer of Health.

Sanitary Department,
Town Hall,
18 .

Dear

of is now ill at home suffering from .
He should not be allowed to return to school for days, and during the same period no other children from the same house should be allowed to attend school.

Yours very truly,

Medical Officer of Health.

To the Head Teacher,
School.

Forms employed in U. 14.

——— Sanitary Authority.

Dear 18 .

I beg to inform you that a child named , residing at is suffering from an infectious disease, and therefore children from this house should not be permitted to attend school until a notice is received from me that the house is free from infection.

I am,
Yours truly,

Medical Officer of Health

To the Head M
of School.

App. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

——— **Sanitary Authority.**

189 .

Dear

I beg to inform you that the house Street, occupied by , is now free from infection, and the children may be again permitted to attend school with safety.

I am,
Yours truly,

Medical Officer of Health.

To the Head M
of School.

Forms employed in U. 10.

Complaint.	Name.	Address.	School.

To the School Attendance Officer .

Private.—For reference only.

Borough of———.

Education Code, 1886, Art. 98.

Public Health Office 189 .

Notice to the Managers of Schools or the Schoolmaster or Schoolmistress of the Existence of Infectious Disease.

Name

The following infectious disease, viz.:
exists in the house situate at , occupied by , members of whose family are said to attend your school.

NOTE.—It is desirable, for the purpose of preventing the spread of the disease above referred to, that no person from the house above mentioned shall attend school until all danger of infection be passed. Where SCARLET FEVER or SMALL-POX exist in any family, no child should attend school from the house for a period of at least six or eight weeks *after the occurrence of the last case.* In the case of DIPHTHERIA, the period should not be less than five weeks; in MEASLES, three weeks; and in ENTERIC (TYPHOID) fever, four weeks. By the diligent exclusion from school of children coming from infected houses, or being themselves not free from infection, much may be done to prevent the spread of the disease. In the event of any difficulty the Medical Officer of Health will be glad to confer with either managers or teachers on the subject.

By direction of the Medical Officer of Health.

Inspector of Nuisances.

To
situate in .

Form employed in R. 9.

——— **Rural Sanitary Authority.**

Date

To the Master or Mistress of School.

I have received notice that , living at , is suffering from , and request that you will not receive any child from that house until all danger of infection is passed.

Medical Officer of Health.

Notice.—It is desirable, for the purpose of preventing the spread of this disease, that no person from the house above mentioned should attend school until all danger of infection is passed. Where the disease known as SCARLET FEVER, WHOOPING COUGH, or SMALL-POX, exists in a house, and the patients are nursed at home, no child should attend school from the house for a period of at least *four weeks*, and only then when all necessary measures of disinfection are certified by this Authority to have been carried out. In the case of measles the period should be not less than three or four weeks, and in cases of typhus or typhoid (enteric) fever, nursed at home, not less than one month. The actual patient should not be re-admitted to school without a certificate of recovery from the medical attendant, and of proper disinfection from this Authority.

In cases where the patient has been at once properly isolated, as by removal to a hospital, the other children may attend school without danger after a much shorter period of quarantine, varying from a completed week to a completed fortnight; or children who show no sign of sickening may be re-admitted to school at once under careful surveillance for similar periods.

By the diligent exclusion from school of children coming from infected houses, or being themselves not free from infection, much may be done to prevent the spread of disease. In the event of any difficulty the Medical Officer of Health will be glad to give any advice or assistance.

Form employed in U. 7.

Town Clerk's Office,

Dear

I am directed by the Sanitary Committee of this borough to call your attention to the very severe and malignant type of an epidemic of measles which, at the present time, is very prevalent in the borough, and causing great mortality amongst young children; and to the fact that no child, at whose home anyone is suffering from whooping cough, measles, or scarlet fever should be allowed to attend school, but that a medical certificate in respect of such child should be obtained, in which case the Government grant to the school would not be lost.

Many instances have come to the Committee's knowledge of such children being threatened for non-attendance, and the Committee will, should any further case of the kind occur, be obliged to take proceedings against the offender.

The Sanitary Committee desire to ask your co-operation in preventing the spread of this or any future epidemic, by not allowing any child, at whose home cases of whooping cough, measles, or scarlet fever exist, to attend school, and by not allowing any child who has suffered from either of those diseases to attend school without first having produced a medical certificate, to the effect that such child is free from contagion.

Yours truly,

Town Clerk.

App. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

Visitation of Invaded Dwellings by an Officer of the Sanitary Authority: Forms recording Conditions observed on Date of Visit.

Form employed in U. 15.

Borough of ——. Sickness—Measles.

Name of patient . Age .
Address
Date of first feeling illness
Other cases of same disease in family or neighbourhood
History of infection
Number of children
Day school attended . Sunday school
Milk supply
State any sanitary defects found

Inspector. .

Date of inspection

Medical Officer of Health.

Form employed in U. 10.

MEASLES.

Name . Age .
Address . Visitor Resident.
If visitor, home address and date of arrival
How long in house
Size of house . Rent .
Medical attendant . First called in .
Notified o'clock on the 189 .
How isolated
Nursed by
Other duties of nurse
Removal to sanatorium . No . Yes at o'clock.
Water supply
Milk supply
Bedding requiring removal

Age.		Occupation.	Place of Work, or School.	*Measles History.	Date of Rash.	Last at Work, or School.
M.	F.					

* A.—Had measles. B.—Not had measles. C.—Now ill of measles.

Laundress
Borrower from free library . Book borrowed at present .
Recent illness in family, relatives, or neighbours
Has patient visited any infected house within a fortnight?
If so, where and when?
Has any person visited within a fortnight from an infected house?
Name, address, and date

Has any article been brought from an infected house?
Name, address, and date
Sanitary defects
Has patient had the disease before?
Probable source of infection

Remarks:—

Dated o'clock this day of 189 .

Signed Inspector.

Printed Instructions as regards Isolation of the Sick in their Homes left by the Visiting Officer of the Sanitary Authority at Invaded Houses.

Form employed in U. 12.

Town Hall, ,
189 .

The children from No. , where MEASLES prevails, or has recently prevailed, must not attend any Sunday or day school, band of hope, school treat, or any other meeting, or go to the juvenile free library, for FOUR weeks from the date of commencement of the last case in the house.

Medical Officer of Health.

A sick child with measles should be isolated from the rest of the household, if possible.

On no account should it be exposed to cold, or its life would thereby be endangered.

Clothing and bed clothes which have been used by the patient should be disinfected by being well boiled in water.

Any articles which will not bear boiling should be thoroughly washed with carbolic soap, and then be freely exposed to out-door air.

After the child has recovered it is still capable of conveying the disease to others for two or three weeks.

Warm baths are especially useful in cleansing the skin after convalescence.

Carbolic soap can be obtained on application at the Town Hall.

Caution.

The Public Health Act provides that any person who—

1. While suffering from any dangerous infectious disorder (including measles) wilfully exposes himself or herself, without proper precautions against spreading the said disorder, in any street, public place, shop, inn, or public conveyance, or enters any public conveyance without previously notifying to the owner, conductor, or driver thereof that he is so suffering; or
2. Being in charge of any person so suffering, so exposes such sufferer; or
3. Gives, lends, sells, transmits or exposes, without previous disinfection, any bedding, clothing, rags, or other things which have been exposed to infection from any such disorder, shall be liable to a penalty of 5*l*.

App. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

Form employed in U. 7.

On the Nature of Measles and the Best Means of Preventing it Spreading.

This disease may be considered a catarrhal fever, with a characteristic rash added to it.

Mild cases often pass unobserved until the rash appears.

Severe cases begin with sore throat, a dry cough, heat of body, a dry or coated tongue, great thirst, signs of a severe cold in the head. Very soon there is swelling of the eyelids, with eyes watery, and painful in the light. On the fourth day a rash appears on the forehead and face, of raised spots of a dull red colour, in the form of small dots, not unlike fleabites, many of the spots join together. All the discharges from the eyes, mouth, and nose, are catching, therefore when a child or any person is affected, it should be at once taken from the rest of the family, and kept in a warm room, as anyone suffering from this disease is in great danger until the rash is well out. If the spots do not make their appearance on the fourth day of the fever, medical aid should be procured, as if the rash is delayed little children may be attacked with convulsions or inflammation of the lungs. It is these complications that cause the death of so many children.

The most dangerous symptoms are dark lips, cold hands and feet, and a rapid feeble pulse.

It is very ridiculous of parents trusting to household remedies in a severe case of this disease, as medical aid, to be efficacious, should be obtained in the early stages of the disorder.

As the greatest danger in measles is the extension of the catarrh to the lungs, all exposure to cold must be avoided, and the patient kept by himself in bed in a warm room, "darkened," as the light is very distressing. A warm bath, or putting the feet in warm water, or sponging the woole body with warm vinigar and water, often does good.

On recovery, smearing the body of the child with oil, to which a little carbolic acid has been added, prevents the patient taking cold, and the ontagion spreading.

Thorough disinfection of all things used by sick upon recovery or death.—Information being given at the Sanitary Inspector's Office, in the Town Hall, or to the Medical Officer of Health, all clothes shall be fetched away, disinfected, and returned, free of all costs.

In case of death, early and quick burial.—Under section 126 of the Public Health, any person who wilfully exposes himself without proper precautions against spreading the said disorder in any street or public conveyance, or sells or transmits any clothing, rags which have been exposed to infection, may be summoned before a magistrate, and is liable to a penalty not exceeding five pounds.

As the Legislature have provided this law to prevent the spread of epidemics, it behoves all parents who have children that are recovering from this disease not to visit other houses, or allow the members of the family to mix or play with other children in the street, or any child to go to school, without a medical certificate that it is free from infection.

Medical Officer of Health.

App. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

Form employed in U. 15.

Health Department,
Town Hall,

Precautions against the Spread of Infection.

Measles is infectious for three weeks from the date of commencement of the first symptoms. During this period the child must be kept isolated in a separate room.

No healthy child from a house where measles is prevalent should be allowed to attend school during the three weeks named above, and if a second case of measles occurs, three weeks must be allowed to elapse from the beginning of this case, before any child from the same house is allowed to attend school.

It is highly dangerous for parents to visit among their neighbours while their children are suffering from measles or any other infectious disease; or to allow children suffering from such disease to play with other children in the street or elsewhere, or to attend school.

By section 126 of the Public Health Act, any person who—

"(1). While suffering from any dangerous infectious disorder, wilfully "exposes himself without proper precautions against spreading "the said disorder in any street, public place, shop, inn, or "public conveyance, without previously notifying to the owner, "conductor or driver thereof that he is so suffering;

"(2). Being in charge of any person so suffering, so exposes such "sufferer; or

"(3). Gives, lends, sells, transmits, or exposes, without previous "disinfection, any bedding, clothing, rags, or other things "which have been exposed to infection from any such disorder "shall be liable to a penalty not exceeding five pounds, and a "person who, while suffering from any such disorder, enters "any public conveyance without previously notifying to the "owner or driver that he is so suffering, shall in addition be "ordered by the Court to pay such owner and driver the "amount of any loss and expense they may incur in carrying "into effect the provisions of this Act, with respect to "disinfection of the conveyance."

N.B.—It should be noted by parents, that although children frequently appear to have recovered from measles at the end of the first week, they are infectious for two more weeks, and wilful exposure of them during this time renders parents liable to prosecution.

Medical Officer of Health.

Form Employed in U. 20.

To Householders.

Prevention of Measles.

Measles is an entirely preventable disease. There is no reason to suppose that it ever arises except from infection. It is a disease which is more fatal in very young children. If all children could be prevented from taking measles until after the age of five, it is probable that only about one-fourth of the number of deaths which at preset result from this disease would take place.

In the year ended September 29th, 1889, there were 485 deaths from this disease alone in the borough of . In the first 13 weeks

App. A. No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

of the year 1891 there were no fewer than 123 deaths in the north and south-east divisions of the township of alone.

It is therefore, highly important, especially if there are infants in the house, that no member of your family should visit, play, or attend at school with others from a house in which measles already exists.

It is highly important also that the mother of a family of small children should avoid entering any house in which there is measles, that she should receive no visitors from such house, and that she should not allow any kind of communication between her family and that in the affected house.

The infection of measles is easily conveyed in the clothing of persons not themselves attacked by the disease. The main cause of measles is probably the infection thus indirectly communicated. You would not willingly give your children arsenic or strychnine. Ought you to convey to them the poison of measles?

Medical Officer of Health.

December, 1892.

Closure of Sunday Schools and Private Schools.

Form Employed in U. 7.

Town Clerk's Office,

Dear Sir,

I am instructed by the Sanitary Authority of the borough of to respectfully request the managers of all the private schools and Sunday schools in the borough to aid them in endeavouring to put an end to the epidemic of measles which is now prevalent, by closing such private and Sunday schools within the district from the date hereof and until and including the 14th day of June next, and within the district from the date hereof until and including the 31st inst.

Notice has been given to the managers of all the day schools in the district to close their schools for one month from this date and in the district for two weeks from this date, and the Sanitary Committee trust that you will see your way to co-operate with them in order to obtain the result desired.

Yours truly,

Town Clerk.

Precautions against Dissemination of Measles by means of Books lent from Public Libraries.

Form used in U. 10.

Private.—Not for publication.

Public Health Office, 189 .

Notice to the Librarian, of the Houses, with the Names of their Occupiers, in which Infectious Disease exists.

I hereby give you notice that infectious disease exists in the house mentioned below. I request you to forward me immediately, *with all* *proper precautions*, any book which may be returned by a borrower inhabiting the house after this date, and until the house is struck off the weekly list. During the same time books should not be lent out to any such readers. After disinfection the books will be returned to you.

App. A. No. 10.
On the Control of Measles; by Dr. Theodore Thomson.

Name.	Address.	Name.	Address.

Medical Officer of Health.

To the Librarian.

Form used in U. 15.

Sanitary Department,
Town Hall,
189 .

List of cases of infectious disease during the week ending for the use of the public librarian.

Private and confidential.

Name.	Address.

Medical Officer of Health.

Forms used in U. 21.

——— Urban Sanitary Authority.

Town Hall 189 .

I beg to inform you that a child named , residing at Street, is suffering from an infectious disease, and therefore the tenants of this house must not be permitted to have books until a notice is received from either the medical gentleman attending the case, or myself, that the house is free from infection.

I am,
Your obedient servant,

Medical Officer of Health.

To the Head Librarian
of the Free Library.

App. A No. 10.

On the Control of Measles; by Dr. Theodore Thomson.

——— Urban Sanitary Authority.

Town Hall 189 .

I beg to inform you that the house Street, occupied by , is now free from infection, and the tenants of this house may again be permitted to have books with safety.

I am,
Your obedient servant,

Medical Officer of Health.

To the Head Librarian
of the Free Library.

Instruction of the Public as regards Measles.

Leaflet issued by the Sanitary Authority of R. 6.

——— Rural Sanitary Authority.

VERY IMPORTANT TO THE PARENTS OF EVERY CHILD.

As measles is very prevalent in places not far away, and in order that you may take steps to prevent it becoming extensively prevalent here, it is important that you should know the following facts:—

Measles is a DANGEROUS disease, and must not be neglected.

Last year it caused more deaths in England than any other infectious disease, except one.

It may cause death by the severity of the attack itself, or by its after effects, such as bronchitis, ear disease, &c.

What is almost as important, it may leave the constitution permanently injured, and sow the seeds of many future diseases.

The ill-effects of measles are all intensified when the disease becomes prevalent in the winter months.

Measles is a very contagious disease, one of the most contagious, and is so from its very commencement, and remains so for THREE WEEKS at least.

Measles spreads very rapidly, because the rash is not the first symptom, but is preceded for three or four days by the symptoms of a severe cold.

AT THIS STAGE BEFORE THE RASH APPEARS, AND WHEN IT IS NOT RECOGNISED AS MEASLES, THE DISEASE IS EXTREMELY CATCHING.

All colds should, therefore, be looked upon with suspicion just now. Keep apart from other people and children, anyone so suffering, for four days at least, when, if it is measles, the rash will have appeared. If you delay isolation until the rash appears, all that are susceptible, who may have come into contact with the patient, will inevitably be attacked later on.

Children of all ages and infants easily catch measles, and those who have had it, may have it a second or even third time. Adults are also frequently attacked.

Anyone who has been exposed to infection may not have the disease for a fortnight.

Prevent the disease coming into your house: ventilate your house freely by keeping your windows open as much as possible, and allow your children to be in the open air as long as possible.

No DISINFECTANT (liquid or powder) has any power to keep the disease away.

If anyone in your house catches the disease, consult a medical man; keep the patient in a room by himself for three weeks, however mild the attack, just as you would if it were scarlet fever or diphtheria; and keep all your children away from school for FOUR WEEKS AFTER THE LAST CASE COMMENCED.

To prevent the disease spreading to other houses, forbid your house to all, and let nobody from your house go into anyone else's.

On the Control of Measles; by Dr. Theodore Thomson.

When the last case is free from contagion, disinfect the sick room by washing everything you possibly can with soap and hot water; put everything you cannot wash to air outside for a day, in the sun if possible. Also, keep the windows of the room wide open for three days in succession.

You are required by Act of Parliament to inform the Medical Officer of Health of EVERY case of measles, or any other infectious disease, which may occur in your house, whether you consult a medical man or not.

Any person who wilfully exposes himself, or anyone in his charge, while suffering from infectious disease, also renders himself liable to a severe penalty.

Medical Officer of Health.
(Address) Union Offices.

December 1894.

Extract from Printed Material on the face of a Calendar issued in 1891 *by the Sanitary Authority of U.* 8.

MEASLES.

Measles starts with watering of the eyes, flushing of the face, running of the nose, pain in the forehead, and cough. It is important to recognise it early, as it is most catching before the rash appears. Keep any child with the above symptoms in a warm room to himself until your medical attendant has seen him. No one from the house should go to school or Sunday school for four weeks.

Instructions printed on a Card issued in 1891 *by the Sanitary Authority of U* 1 *through the Medium of Schools.*

Corporation of .—Sanitary Department.

INSTRUCTIONS as to INFECTIOUS DISEASE.

With a view to lesson the mortality from infectious disease—particularly from measles and scarlet fever amongst children—the attention of parents and others is drawn to the following simple precautions which should in all cases be adopted:—

Communications with infected houses or persons should be carefully avoided.

The house, back-yard, lobby, gullies, and ashpit, should be kept as clean as possible.

If the disease be contracted, the patient—if not removed to hospital—should be at once placed in a bedroom removed as far as possible from the living rooms of the house, furnished with a fire-place, and from which all carpets, bed-hangings, &c., have been removed.

The mother, or some other one person, should act as nurse, and should associate as little as possible with the other members of the household.

Visitors, especially children, should not be allowed to enter the sick room.

Children living in infected houses, or recovering from disease, must not attend school until after the house has been disinfected.

No books must be obtained from public libraries.

Disinfectants should be freely used about the house, and all articles of clothing, eating utensils, &c., should be placed in water containing some disinfectant before being removed from the sick room.

On the Control of Measles; by Dr. Theodore Thomson.

The patient's discharges, especially in cases of typhoid fever, should be received in a utensil containing a disinfectant.

Pieces of rag which can at once be burnt should in all cases be used instead of pocked handkerchiefs, but especially in cases of diphtheria, where infection is readily conveyed by the discharges from the mouth and nose.

Medical advice should be obtained on the first appearance of the disease, and the instructions of the medical attendant should be carefully followed. Many deaths result from a neglect to obtain such assistance until too late.

It should be remembered that all cases, however mild, are capable of spreading infection, and that a severe case may be the result of contact with a mild one.

During the illness, and for some time afterwards, when the patient is convalescent, great care should be taken to avoid danger from colds. Many children die from croup, bronchitis, or inflammation of the lungs, contracted during recovery from measles, or from dropsy, the result of a chill during the process of desquamation—or peeling of the skin—after scarlet fever.

In case of death the coffin should contain some disinfectant—as carbolic acid powder—and should be closed up at once. The funeral should take place as soon as possible, and no unnecessary invitations should be given.

After recovery or death the house should be thoroughly fumigated and cleansed; application should be made to the sanitary office .
Disinfectants may also be gratuitously obtained at the sanitary yard,

Note.—By the Public Health Act of 1875, a penalty of not exceeding five pounds is imposed for exposure of infected persons or things. This applies to selling or pawning infected articles.

January, 1891. Medical Officer of Health.

No. 11.

APP. A. No. 11.

On the Provision of Isolation Hospital Accommodation by Local Authorities.

MEMORANDUM on the PROVISION of ISOLATION HOSPITAL ACCOMMODATION by LOCAL AUTHORITIES.

ENGLISH communities nowadays recognise the advantage of isolation hospitals as a means of preventing the spread of infectious diseases from persons who cannot be properly isolated in their own homes. But too often the provision of such hospitals is put off until some infectious disease is immediately threatening or has actually invaded a district. It cannot be too clearly understood that an isolation hospital, to fulfil its proper purpose of sanitary defence, ought to be in readiness beforehand. During the progress of an epidemic it is of little avail to set about hospital construction. The mischief of allowing infection to spread from first cases will already have been done, and this mischief cannot be repaired. Thus, hospitals provided during an epidemic are mainly of advantage to particular patients; they have little effect in staying the further spread of infection. Moreover, hospitals provided under such circumstances, to be of any use, must be large and costly; and their construction can seldom be of a kind that is suited in after times for the isolation requirements of their districts.

The present memorandum is designed to represent to Urban and Rural District Councils who are without means of isolation for first cases of infectious sickness appearing in their districts, as also to those who are responsible for the health of special communities in public institutions or elsewhere, the importance of providing isolation hospital accommodation, and of doing so before the invasion of actual infection. It is further intended to suggest to authorities of rural districts and of small towns the means by which they may most advantageously make such provision. Some general principles to be held in view by all authorities who are about to establish isolation hospitals for their districts will be illustrated in the course of the memorandum.

AS REGARDS VILLAGES.—Large villages and groups of adjacent villages will commonly require the same sort of provision as towns. Where good roads and proper arrangements for the conveyance of the sick have been provided, the best arrangement for village populations is by a small building accessible from several villages; otherwise the requisite accommodation for (say) four cases of infectious disease in a village may at times be got in a fairly isolated and otherwise suitable four-room or six-room cottage which has been acquired by the Authority; or by arrangement made beforehand with some trustworthy cottage-holders, not having children, that they should receive and nurse, on occasion, patients requiring such accommodation.

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On the Provision of Isolation Hospital Accommodation by Local Authorities.

In Towns, hospital accommodation for infectious diseases is wanted more constantly, as well as in larger amount than in villages; and in towns there is greater probability that room will be wanted at the same time for two or more infectious diseases which have to be treated separately. The permanent provision to be made in a town should consist of not less than four rooms, in two separate pairs; each pair to receive the sufferers from one infectious disease, men and women of course separately. The number of cases for which permanent provision should be made must depend upon various considerations, among which the size and the growth of the town, the housing and habits of its population, and the traffic of the town with other places, are the most important. There is no fixed standard therefore by which the standing hospital requirements proper for a town can be measured. Furthermore, it is to be remembered that occasions will arise (as where infection is brought into several parts of a town at one time) when isolation provision, in excess of that commonly sufficient for the town, will become needful.

For a town the hospital provision ought to consist of wards in one or more permanent buildings, with space enough for the erection of other wards, temporary or permanent. Considerations of ultimate economy make it wise to have permanent buildings sufficient for somewhat more than the average necessities of the place, so that recourse to temporary extensions may less often be necessary. In any case it is well to make the administrative offices somewhat in excess of the wants of the permanent wards; because thus, at little additional first cost, they will be ready to serve, when occasion comes, for the want of temporary extensions.

Plans illustrating the sanitary requirements of small hospitals for infectious disease are arranged on three sheets accompanying the present memorandum. Plan A, on the first sheet, is that of a little building to hold two patients of each sex. On the second sheet a plan and a section (B.) of a rather larger hospital building are shown, providing for eight patients, with separation of sexes, and also of one infectious disease from another. A convenient disposition of buildings upon site is also indicated on the same sheet. The third sheet shows a plan and section (C.) of a small pavilion adapted to receive six male and six female patients suffering under one kind of infectious disease. It will be found that in all the plans proper standards of space are observed, viz., not less that 2,000 cubic feet of air space, than 144 square feet of floor space, and 12 linear feet of wall space to each bed; and that means are provided for the adequate ventilation and warming of wards, and for securing them from closet emanations and the like. In plan A, earth-closets, in other plans water-closets, are indicated as the means of excrement disposal. The latter are to be regarded as preferable where efficient sewers are available. Places for washing

On the Provision of Isolation Hospital Accommodation by Local Authorities.

and disinfection, and for a mortuary, are indicated. It will be observed that an interval of 40 feet is everywhere interposed between every building used for the reception of infected persons or things and the boundary of the hospital site. This boundary should have a close fence of not less than 6 feet 6 inches in height, and the 40 feet of interval should not afterwards be encroached on by any temporary building or other extension of the hospital. In the construction and arrangement of such temporary buildings as may at times be wanted in extension of the permanent hospital the same principles should be held in view.

In determining the locality where an infectious hospital should be placed, the wholesomeness of the site, the character of the approaches, together with the facilities for water supply and for slop and refuse removal, are matters of primary importance.

Hospitals for Small pox.—Ever since the issue in 1882 of the report of the Royal Commission on Small-pox and Fever Hospitals great difficulty has arisen in the selection of sites for the reception of patients suffering from small-pox. Small-pox hospitals have again and again served to disseminate that disease to neighbouring communities, and this, to use the words of the Royol Commission, "in spite of precautions "almost in excess of any that could have been anticipated." There is, as yet, no evidence available to indicate at what distance from populations, whether aggregated in institutions or living in dwelling-houses, small-pox hospitals may be established without risk to persons who are susceptible of small-pox infection; but that distance is often a very considerable one. It may, however, be laid down, with a view of lessening the risk of infection, that a local authority should not contemplate the erection of a small-pox hospital—

1st. On any site where it would have within a quarter of a mile of it as a centre either a hospital, whether for infectious diseases or not, or a workhouse, or any similar establishment, or a population of 150–200 persons.

2ndly. On any site where it would have within half-a-mile of it as a centre a population of 500–600 persons whether in one or more institutions or in dwelling-houses.

It must also be understood that even where the above conditions are strictly fulfilled, there may be circumstances under which the erection of a small-pox hospital should not be contemplated. Cases in which there is any considerable collection of inhabitants just beyond the half-mile zone should always call for special consideration.

It has been suggested that small-pox hospitals may be so constructed as not to be dangerous to neighbouring habitations; and that this can be done by a system of passing through a furnace all outgoing air from infected wards and places. But, thus far, the efforts made in this direction cannot be regarded as having successfully attained the end in view.

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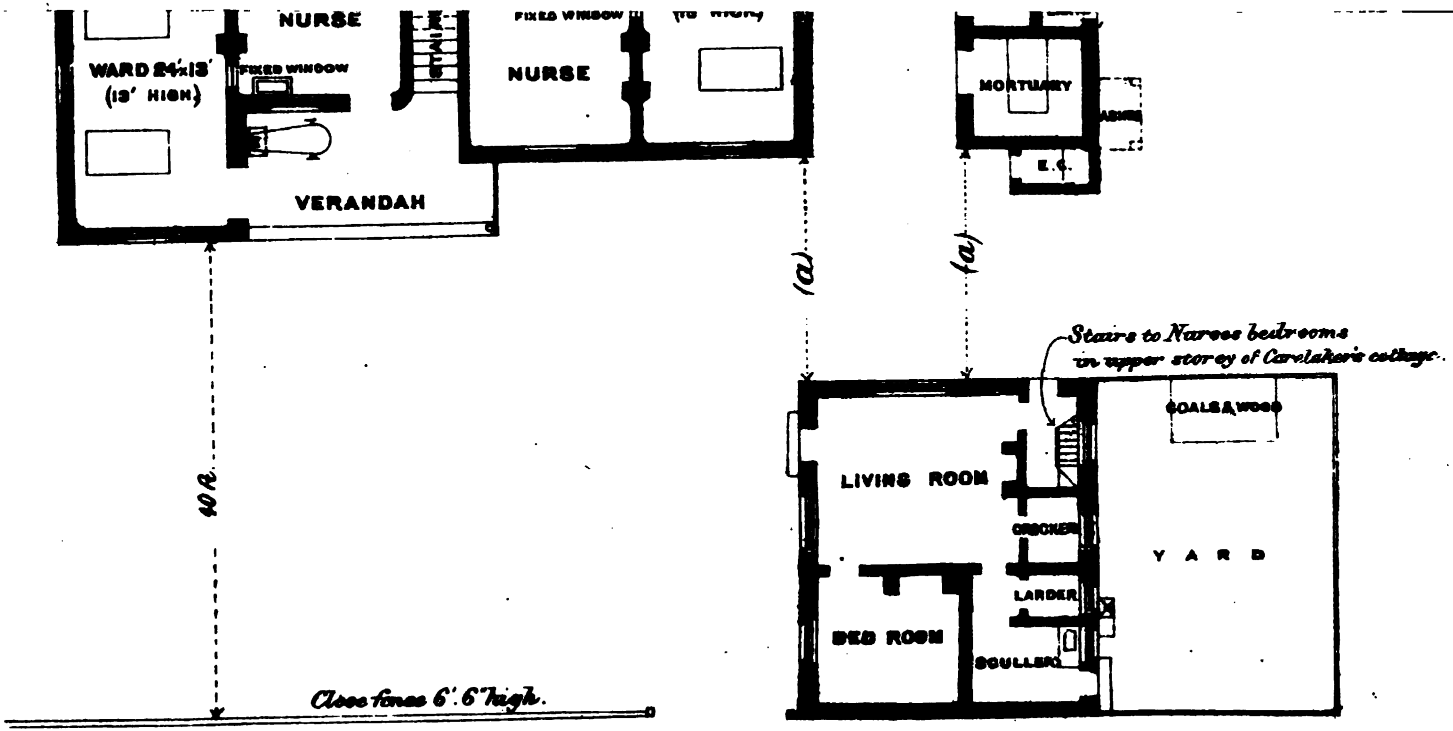
Useful information on points of construction and administration of isolation hospitals, derived from experience of them in various parts of England and Wales, will be found in a report [C.—3290] of the Medical Department, 1882—re-issued in 1894.

R. THORNE THORNE.
Medical Officer.

Local Government Board,
Medical Department,
January 1895.

PLAN A.



PLAN.

Scale 16 ft to one inch.

Wyman & Sons, L^d lith 83 Carter Lane 7823.12.83.

App. A. No. 12.

On Epidemic Influenza.

No. 12.

MEMORANDUM on EPIDEMIC INFLUENZA, March 1895.

Influenza became epidemic in England in the winter of 1889–90; it recurred in epidemic form in the spring of 1891, and was maintained up to June of that year; a third epidemic took place in the winter of 1891–92, and after a minor recrudescence in the spring of 1893, a fifth prevalence on a wide scale took place in the winter of 1893–94. England is now passing through a sixth epidemic period. Two detailed reports have been issued by the Board on the subject. The first was by Dr. Parsons, "On the Influenza Epidemic of 1889–90," with an introduction by Sir George Buchanan, M.D., F.R.S., the Board's Medical Officer at that date.* The second was a "Further Report on Epidemic Influenza, 1889–92," by Dr. Parsons, with papers on the Clinical and Pathological aspects of the disease, by Dr. Klein, F.R.S., and an introduction by myself.†

A "Provisional Memorandum upon Precautions advisable at times when Epidemic Influenza threatens, or is prevalent," was also drawn up by me in January 1892, and was issued by the Board to local sanitary authorities.

The further study made by the Medical Department as to the natural history of Influenza, and as to its clinical and bacteriological characteristics, goes to show that it is a disease against which it is most difficult to apply measures of prevention with any substantial prospect of success.

Influenza is highly infective from person to person; its infectious quality is often manifested before the disease is fully recognised; its incubation period is one of the shortest of all infectious diseases; it varies so much in intensity that many cases are never diagnosed at all; one attack confers no marked immunity against another; and the infection is largely eliminated by means of the lungs, the sputa of the sick being invariably charged, during the acute stage of the disease, with its pathognomonic micro-organism. The disease calls primarily for measures of isolation and of disinfection, but there are difficulties in making any such measures universally applicable. Wherever they can be carried out, the following precautions should, however, be adopted:—

1st. The sick should be separated from the healthy. This is especially important in the case of first attacks in a locality or a household.

2nd. The sputa of the sick should, especially in the acute stage of the disease, be received into vessels containing disinfectants. Infected articles and rooms should be cleansed and disinfected.

3rd. When influenza threatens, unnecessary assemblages of persons should be avoided.

4th. Buildings and rooms in which many people necessarily congregate should be efficiently aërated and cleansed during the intervals of occupation.

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* Report on the Influenza Epidemic of 1889–90, by Dr. Parsons, with an Introduction by the Medical Officer of the Local Government Board. [C.—6387], pp. 324.—Eyre and Spottiswoode, East Harding Street, E.C.

† Further Report and Papers on Epidemic Influenza, 1889–92, with an Introduction by the Medical Officer of the Local Government Board. [C.—7051], pp. 154.—Eyre and Spottiswoode, East Harding Street, E.C.

It should be borne in mind that the liability to contract Influenza, and also the danger of an attack, if contracted, are increased by depressing conditions, such as exposure to cold, and to fatigue, whether mental or physical. Attention should hence be paid at epidemic periods to all measures tending to the maintenance of health, such as the use of clothing of suitable warmth, and a sufficiency of wholesome food.

Persons who are attacked by Influenza should at once seek rest, warmth, and medical treatment, and they should bear in mind that the risk of relapse, with dangerous complications, constitutes a chief danger of the disease.

R. THORNE THORNE.

Nos. 13 and 13(*a*).

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases and registered Deaths therefrom.

COMPILATION of RETURNS of NOTIFIED CASES of CERTAIN INFECTIOUS DISEASES, and REGISTERED DEATHS therefrom.

1894.

It should be noted, with reference to these returns, that some of the districts to which they apply administer compulsory notification under local Acts; and that not only are some of the diseases named in the Infectious Disease (Notification) Act of 1889 not notifiable under some of the local Acts, but that under some of these Acts no payment is made for the notification of multiple attacks of the same disease occurring in the same house within a specified date of the first attack notified.

The Urban Districts finding place in these returns in which compulsory notification has been adopted under local Acts are—

Accrington.
Ashton-under-Lyne.
Birkenhead.
Blackburn.
Bolton.
Burnley.
Bury.
Croydon.
Darwen.
Derby.
Halifax.
Hartlepool.
Huddersfield.
Leicester.
Manchester.
Newcastle-on-Tyne.
Norwich.
Nottingham.
Oldham.
Preston.
Reading.
Rotherham.
Stockton-on-Tees.
Sunderland.
Swansea.
Wakefield.
Warrington.
West Ham.
Wigan.
Willesden.
York.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

No. 13.

TABLE showing Quarter by Quarter, during the Year 1894, for each of REGISTERED DEATHS from the under-mentioned DISEASES, together SANITARY DISTRICTS in question.

[The Cases are a Summary of the Weekly Returns of Notifiable Diseases received Quarterly Returns of

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	SMALL-POX.									
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1894.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
I.	London (*Administrative Co.*)	4,232,118	184	11	461	34	469	43	84	5	1,198	93
II. South-Eastern.	Croydon	102,695	—	—	2	—	3	—	1	—	6	—
	Dover	33,300	—	—	—	—	—	—	—	—	—	—
	Eastbourne	34,969	—	—	—	—	—	—	—	—	—	—
	Bournemouth	37,781	—	—	—	—	3	—	—	—	3	—
	Southampton	65,325	1	—	6	1	10	3	—	—	17	4
	Reading	60,054	—	—	6	—	—	—	—	—	6	—
III. South Midland.	Willesden	61,265	4	—	1	—	12	2	2	—	19	2
	Hornsey	44,205	1	—	—	—	1	—	—	—	2	—
	Tottenham	71,343	1	1	2	—	1	—	—	—	4	1
	Oxford	45,742	—	—	1	—	—	—	—	—	1	—
	Northampton	61,012	—	—	—	—	—	—	—	—	—	—
	Cambridge	36,983	—	—	2	—	—	—	—	—	2	—
	Leyton	63,056	32	—	33	—	4	—	—	—	69	—
IV. Eastern	Walthamstow	46,346	9	—	3	—	—	—	—	—	12	—
	West Ham	204,903	227	21	261	28	17	—	4	—	509	49
	Colchester	34,559	—	—	—	—	—	—	—	—	—	—
	Norwich	100,970	—	—	1	—	—	—	—	—	1	—
V. South-Western.	Exeter	37,404	1	—	—	—	—	—	—	—	1	—
	Plymouth	84,248	—	—	5	1	19	4	2	—	26	5
	Devonport	54,803	—	—	1	—	13	—	2	—	16	—
	Bath	51,814	2	—	—	—	—	—	—	—	2	—
VI. West Midland.	Bristol	221,578	185	15	11	1	5	—	—	—	201	16
	St. George	36,718	31	6	1	—	—	—	—	—	32	6
	Gloucester	39,444	1	—	3	—	2	—	1	—	7	—
	Burton-on-Trent	46,047	—	—	1	—	—	—	—	—	1	—
	Wolverhampton	82,662	—	—	22	3	26	2	20	—	68	5
	Walsall	71,789	137	9	16	—	19	1	2	—	174	10
	West Bromwich	59,474	6	—	17	—	7	—	11	1	41	1
	Worcester	42,903	14	—	47	2	2	—	—	—	63	2
	Smethwick	36,170	11	—	74	5	11	—	35	4	131	9
	Birmingham	478,113	725	66	656	53	305	20	405	31	2,091	170
	Aston Manor	68,639	102	6	47	6	25	1	30	2	204	15
	Coventry	52,724	2	—	13	1	1	—	1	—	17	1
VII. North Midland.	Leicester	174,624	4	—	3	—	1	—	1	—	9	—
	Grimsby	51,934	—	—	—	—	—	—	—	—	—	—
	Nottingham	213,877	59	3	6	—	—	—	—	—	65	3
	Derby	94,146	—	—	3	—	1	—	—	—	4	—

No. 13.

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

83 Urban Sanitary Districts, the Number of Notified Cases of and of with an Annual Summary of these data for each of the Urban by the Board from Medical Officers of Health. The Deaths are extracted from the the Registrar-General.]

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Small-Pox—*continued.*									
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1894.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
VIII. North-Western.	Stockport	70,263	—	—	18	1	16	—	—	—	34	1
	Macclesfield	36,000	—	—	4	—	—	—	—	—	4	—
	Birkenhead	99,857	1	—	3	—	2	—	6	1	12	1
	Wallasey	33,229	—	—	—	—	—	—	1	—	1	—
	Liverpool	517,980	5	1	26	1	59	3	133	15	223	20
	St. Helens (Lancs.)	71,288	—	—	2	—	—	—	—	—	2	—
	Southport	41,406	—	—	1	—	4	—	—	—	5	—
	Wigan	55,013	—	—	2	1	—	—	—	—	2	1
	Warrington	52,743	—	—	2	—	1	—	—	—	3	—
	Bolton	115,002	—	—	—	—	2	—	—	—	2	—
	Bury (Lancs.)	57,212	3	—	22	5	3	1	1	—	29	6
	Salford	198,139	—	—	31	1	9	1	—	—	40	2
	Manchester	505,368	16	1	197	16	64	5	7	1	284	23
	Ashton-under-Lyne	40,463	—	—	2	—	1	—	—	—	3	—
	Oldham	131,463	124	19	33	2	8	2	—	—	165	23
	Accrington	38,603	—	—	2	—	—	—	—	—	2	—
	Burnley	87,016	—	—	2	—	7	—	6	—	15	—
	Blackburn	120,064	1	—	6	—	6	—	—	—	13	—
	Darwen	34,192	—	—	5	—	1	—	—	—	6	—
	Preston	107,573	1	—	22	1	11	—	—	—	34	1
	Barrow-in-Furness	51,712	—	—	—	—	—	—	—	—	—	—
IX. Yorkshire.	Huddersfield	95,420	—	—	2	—	2	—	1	—	5	—
	Halifax	89,832	7	2	2	—	4	1	4	1	17	4
	Bradford	216,361	141	22	47	4	7	1	1	—	196	27
	Leeds*	367,505	—	—	—	—	10	1	6	—	16	1
	Wakefield	33,146	33	—	8	—	9	—	—	—	50	—
	Barnsley	35,427	—	—	5	—	—	—	—	—	5	—
	Sheffield	324,243	1	—	1	—	7	—	—	—	9	—
	Rotherham	42,061	1	—	—	—	—	—	—	—	1	—
	York	67,004	1	—	1	—	1	—	—	—	3	—
	Hull	200,044	15	1	11	—	1	—	9	2	36	3
	Middlesbrough	75,532	9	—	7	2	10	2	2	—	28	4
X. Northern.	Darlington	38,060	—	—	—	—	—	—	1	—	1	—
	Stockton-on-Tees*	49,705	—	—	—	—	—	—	—	—	—	—
	Hartlepool	21,271	—	—	—	—	7	—	1	—	8	—
	West Hartlepool	42,710	—	—	—	—	12	3	—	—	12	3
	Sunderland	131,015	—	—	7	—	1	—	2	—	10	—
	South Shields	78,391	10	—	3	—	—	—	2	—	15	—
	Newcastle-on-Tyne	186,300	—	—	3	—	—	—	—	—	3	—
	Tynemouth	46,588	—	—	—	—	—	—	—	—	—	—
	Carlisle	39,176	—	—	2	—	—	—	—	—	2	—
XI. Welsh.	Newport (Mon.)	54,707	1	—	—	—	1	—	—	—	2	—
	Cardiff	128,915	9	1	1	—	—	—	—	—	10	1
	Merthyr Tydfil	58,080	—	—	—	—	—	—	1	—	1	—
	Swansea	90,349	6	—	1	—	—	—	1	—	8	—
	Totals, 83 Districts	12,312,200	2,129	185	2,181	169	1,223	96	786	63	6,319	513

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* Did not commence to send in Returns until week ended 28th July 1894.

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Scarlet Fever.									
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1894.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
I.	London - - (*Admin. Co.*)	4,232,118	4,882	276	4,949	285	4,520	228	4,142	175	18,493	964
II. South-Eastern.	Croydon - -	102,695	101	4	60	3	84	—	62	1	307	8
	Dover - -	33,300	6	—	1	—	5	—	21	—	33	—
	Eastbourne -	34,969	31	1	21	—	6	—	9	—	67	1
	Bournemouth -	37,781	21	—	38	2	25	1	14	—	98	3
	Southampton -	65,325	17	1	13	—	21	1	28	1	79	3
	Reading - -	60,054	42	1	59	1	44	—	56	2	201	4
III. South Midland.	Willesden -	61,265	93	2	73	3	51	2	50	—	267	7
	Hornsey -	44,205	44	—	54	1	43	—	48	—	189	1
	Tottenham -	71,343	59	3	54	2	62	—	25	—	200	5
	Oxford - -	45,742	94	7	120	3	51	1	59	4	324	15
	Northampton -	61,012	35	1	91	—	143	2	160	5	429	8
	Cambridge -	36,983	16	—	17	—	33	—	41	3	107	3
	Leyton - -	63,056	127	2	78	1	136	3	143	6	484	12
IV. Eastern.	Walthamstow -	46,346	128	2	48	1	37	—	37	—	250	3
	West Ham -	204,903	275	12	225	5	238	10	323	9	1,061	36
	Colchester -	34,559	8	1	12	—	6	—	54	—	80	1
	Norwich -	100,970	131	4	115	5	148	3	153	3	547	15
V. South-Western.	Exeter - -	37,404	94	3	43	2	44	3	42	4	223	12
	Plymouth -	84,248	62	4	34	1	31	2	53	1	180	8
	Devonport -	54,803	37	1	25	5	37	2	15	1	114	9
	Bath - -	51,844	26	1	15	1	30	2	32	1	103	5
VI. West Midland.	Bristol - -	221,578	177	4	123	5	107	4	83	3	490	16
	St. George -	36,718	26	1	40	—	46	2	60	1	172	4
	Gloucester -	39,444	32	—	10	—	34	2	30	—	106	2
	Burton-on-Trent	46,047	85	3	45	—	53	—	40	2	223	5
	Wolverhampton	82,662	181	6	283	19	295	18	367	10	1,126	53
	Walsall - -	71,789	33	—	25	1	19	—	22	—	99	1
	West Bromwich	59,474	33	3	22	—	14	1	24	—	93	4
	Worcester -	42,908	42	—	26	—	34	1	26	—	128	1
	Smethwick -	36,170	56	1	10	—	9	—	41	1	116	2
	Birmingham -	478,113	325	18	389	17	519	14	563	27	1,796	76
	Aston Manor -	68,639	27	1	32	2	39	—	36	1	134	4
	Coventry -	52,724	9	—	24	1	133	5	213	5	379	11
VII. North Midland.	Leicester -	174,624	224	9	264	14	221	5	224	2	933	30
	Grimsby -	51,934	55	2	32	4	52	3	66	1	205	10
	Nottingham -	213,877	324	18	269	9	198	8	360	16	1,151	51
	Derby - -	94,146	93	5	95	1	151	4	170	5	509	15

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	SCARLET FEVER—*continued.* 1st Quarter. Cases.	1st Quarter. Deaths.	2nd Quarter. Cases.	2nd Quarter. Deaths.	3rd Quarter. Cases.	3rd Quarter. Deaths.	4th Quarter. Cases.	4th Quarter. Deaths.	Total for 1894. Cases.	Total for 1894. Deaths.
VIII. North-Western.	Stockport - -	70,263	60	1	69	3	61	2	38	—	228	6
	Macclesfield -	36,000	18	1	11	—	9	1	5	—	43	2
	Birkenhead -	99,857	96	3	46	2	102	3	133	4	377	12
	Wallasey - -	33,229	114	—	57	—	38	—	30	—	239	—
	Liverpool - -	517,980	1,022	61	944	55	959	53	1,050	60	3,975	229
	St. Helens (Lancs.)	71,288	117	4	121	5	60	2	47	3	345	14
	Southport - -	41,406	63	2	55	1	64	2	87	3	269	8
	Wigan - -	55,013	72	3	117	7	92	4	79	1	360	15
	Warrington -	52,743	63	9	73	14	85	12	133	8	354	43
	Bolton - -	115,002	75	3	79	4	57	1	54	1	265	9
	Bury (Lancs.) -	57,212	172	5	117	11	95	3	64	2	448	21
	Salford - -	198,139	204	15	285	39	234	26	310	32	1,033	112
	Manchester -	505,368	449	27	499	19	551	36	725	31	2,224	113
	Ashton-under-Lyne	40,463	62	—	36	2	40	—	38	2	176	4
	Oldham - -	131,463	85	6	68	7	64	5	46	3	263	21
	Accrington - -	38,603	13	—	13	—	32	1	70	1	128	2
	Burnley - -	87,016	202	21	214	9	337	12	285	9	1,038	51
	Blackburn - -	120,064	19	1	36	2	57	4	39	2	151	9
	Darwen - -	34,192	52	1	29	1	28	1	20	—	129	3
	Preston - -	107,573	78	9	45	2	28	1	26	—	177	12
	Barrow-in-Furness	51,712	67	3	91	3	95	3	78	2	331	11
IX. Yorkshire.	Huddersfield -	95,420	111	8	109	3	115	4	127	8	462	23
	Halifax - -	89,832	50	2	33	1	21	—	9	—	113	3
	Bradford - -	216,361	288	21	288	19	254	18	205	14	1,035	72
	Leeds* - -	367,505	—	—	—	—	174	6	273	16	447	22
	Wakefield - -	33,146	8	—	16	—	6	—	6	—	36	—
	Barnsley - -	35,427	36	2	28	3	41	—	133	9	238	14
	Sheffield - -	324,243	181	10	203	7	195	12	267	11	846	40
	Rotherham - -	42,061	32	1	60	8	126	8	108	10	326	27
	York - -	67,004	19	—	27	1	31	1	31	—	108	2
	Hull - - -	200,044	233	14	161	7	160	8	196	10	750	39
	Middlesbrough -	75,532	60	1	27	2	12	—	33	—	132	3
X. Northern.	Darlington - -	38,060	19	1	18	—	8	—	21	—	66	1
	Stockton-on-Tees* -	49,705	—	—	—	—	126	3	276	12	402	15
	Hartlepool - -	21,271	5	—	4	—	3	—	10	—	22	—
	West Hartlepool -	42,710	13	—	19	—	12	—	17	—	61	—
	Sunderland -	131,015	191	10	145	6	111	3	254	6	701	25
	South Shields -	78,391	156	8	152	6	147	2	249	13	704	29
	Newcastle-on-Tyne	186,300	145	3	190	8	176	6	309	12	820	29
	Tynemouth - -	46,588	69	9	66	4	83	4	39	2	257	19
	Carlisle - -	39,176	29	1	17	—	17	—	14	—	77	1
XI. Welsh.	Newport (Mon.) -	54,707	55	1	14	1	28	1	49	1	146	4
	Cardiff - -	128,915	161	1	26	2	123	1	167	4	577	8
	Merthyr Tydfil -	58,080	83	5	47	3	34	1	39	1	203	10
	Swansea - -	90,349	154	4	92	10	71	4	150	5	467	23
	Totals, 83 Districts	12,312,200	13,252	674	12,681	671	12,881	581	14,231	588	53,045	2,514

* Did not commence to send in Returns until week ended 28th July 1894.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	DIPHTHERIA.									
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1894.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
I.	London - - (*Admin. Co.*)	4,232,118	2,585	728	2,691	651	2,598	641	2,792	653	10,666	2,673
II. South-Eastern.	Croydon -	102,695	46	8	36	9	48	9	34	6	164	32
	Dover - -	33,300	3	1	—	1	4	—	2	—	9	2
	Eastbourne -	34,969	15	3	5	1	6	—	14	1	40	5
	Bournemouth -	37,781	1	1	6	3	1	1	7	2	15	7
	Southampton -	65,325	9	—	8	1	11	4	11	—	39	5
	Reading -	60,054	8	3	5	2	5	1	3	—	21	6
III. South Midland.	Willesden -	61,265	35	3	41	7	24	3	26	3	126	16
	Hornsey -	44,205	32	7	42	8	23	4	18	5	115	24
	Tottenham -	71,343	40	13	22	7	28	11	26	1	116	32
	Oxford - -	45,742	19	6	19	4	11	3	21	8	70	21
	Northampton -	61,012	5	3	3	3	2	1	2	—	12	7
	Cambridge -	36,983	1	1	—	—	3	1	3	1	7	3
	Leyton - -	63,056	74	4	110	7	53	7	65	8	302	26
IV. Eastern.	Walthamstow -	46,346	18	4	22	5	29	6	53	17	122	32
	West Ham -	204,903	179	50	152	20	160	33	355	87	846	190
	Colchester -	34,559	15	3	6	1	7	4	3	1	31	9
	Norwich -	100,970	33	7	20	1	32	5	35	5	120	18
V. South-Western.	Exeter - -	37,404	3	—	3	4	7	6	8	4	21	14
	Plymouth -	84,248	21	1	15	2	5	—	11	2	52	5
	Devonport -	54,803	6	—	3	3	—	—	5	1	14	4
	Bath - -	51,844	9	4	8	3	6	2	25	6	48	15
VI. West Midland.	Bristol - -	221,578	26	13	22	6	28	13	38	16	114	48
	St. George -	36,718	4	2	5	2	5	2	2	1	16	7
	Gloucester -	39,444	8	3	7	2	4	—	10	2	29	7
	Burton-on-Trent	46,047	6	—	11	2	12	2	22	3	51	7
	Wolverhampton	82,662	13	6	15	8	33	10	22	11	83	35
	Walsall - -	71,789	2	1	4	1	2	1	4	2	12	5
	West Bromwich	59,474	6	3	6	2	1	1	—	—	13	6
	Worcester -	42,908	10	4	8	—	8	2	7	1	33	7
	Smethwick -	36,170	1	1	3	—	3	2	4	1	11	4
	Birmingham -	478,113	57	18	65	22	75	11	122	24	319	75
	Aston Manor -	68,639	16	7	7	1	14	—	7	2	44	10
	Coventry -	52,724	8	3	2	—	2	—	2	—	14	3
VII. North Midland.	Leicester -	174,624	19	1	14	3	15	2	12	7	60	13
	Grimsby - -	51,934	53	11	35	7	10	1	16	3	114	22
	Nottingham -	213,877	21	9	11	2	8	3	14	4	54	18
	Derby - -	94,146	15	3	10	—	10	1	10	1	45	5

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Diphtheria—*continued.*									
			1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.		Total for 1894.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
VIII. North-Western.	Stockport - -	70,263	7	7	3	—	7	2	4	1	21	10
	Macclesfield -	38,000	—	1	1	1	1	1	3	2	5	5
	Birkenhead -	99,857	36	14	23	7	44	10	32	10	135	41
	Wallasey - -	33,229	8	—	8	—	5	—	10	—	31	—
	Liverpool - -	517,980	64	26	49	15	66	22	96	34	275	97
	St. Helens (Lancs.)	71,288	24	6	22	1	8	—	29	4	83	11
	Southport - -	41,406	11	3	12	3	4	2	10	4	37	12
	Wigan - -	55,018	2	—	1	1	2	—	4	3	9	4
	Warrington -	52,743	2	1	2	—	1	2	4	3	9	6
	Bolton - -	115,002	16	3	3	2	4	2	2	3	25	10
	Bury (Lancs.) -	57,212	8	4	14	2	9	4	11	9	42	19
	Salford - -	198,139	55	26	46	10	47	15	53	12	201	63
	Manchester -	505,368	117	58	119	26	106	19	116	43	458	146
	Ashton-under-Lyne	40,463	4	1	8	2	1	1	1	—	14	4
	Oldham - -	131,463	12	7	18	9	17	10	20	13	67	39
	Accrington - -	38,603	2	1	3	—	11	—	21	2	37	3
	Burnley - -	87,016	18	7	13	8	16	5	22	9	69	29
	Blackburn - -	120,064	2	2	10	3	7	4	17	9	36	18
	Darwen - -	34,192	2	—	4	1	—	—	1	1	7	2
	Preston - -	107,573	15	3	2	—	13	5	8	—	38	8
	Barrow-in-Furness	51,712	8	4	10	7	3	3	10	3	31	17
IX. Yorkshire.	Huddersfield -	95,420	5	4	9	8	11	8	10	2	35	22
	Halifax - -	89,832	10	6	8	—	10	1	11	5	39	12
	Bradford - -	216,361	16	8	9	4	8	2	16	3	49	17
	Leeds* - -	367,505	—	—	—	—	27	15	44	15	71	30
	Wakefield - -	33,146	2	—	2	—	1	—	8	—	13	—
	Barnsley - -	35,427	10	—	6	—	11	2	17	5	44	7
	Sheffield - -	324,243	30	19	17	12	21	22	24	13	92	66
	Rotherham -	42,061	4	—	6	1	3	1	1	—	14	2
	York - -	67,004	6	1	9	—	4	—	4	—	23	1
	Hull - - -	200,044	22	4	16	7	20	2	28	16	86	29
	Middlesbrough -	75,532	3	4	11	4	8	1	9	4	31	13
X. Northern.	Darlington - -	38,060	—	2	4	4	4	2	1	1	9	9
	Stockton-on-Tees*	49,705	—	—	—	—	3	2	2	2	5	4
	Hartlepool - -	21,271	2	—	—	—	—	—	2	—	4	—
	West Hartlepool -	42,710	4	7	2	3	11	7	11	4	28	21
	Sunderland -	131,015	5	4	4	1	3	2	7	2	19	9
	South Shields -	78,391	10	1	2	—	13	1	17	2	42	4
	Newcastle-on-Tyne	186,300	36	12	24	5	19	5	32	10	111	32
	Tynemouth -	46,588	6	3	5	2	9	2	7	—	27	7
	Carlisle - -	39,176	6	2	4	1	10	1	8	—	28	4
XI. Welsh.	Newport (Mon.) -	54,707	10	4	4	4	3	—	10	3	27	11
	Cardiff - -	128,915	73	19	94	23	85	13	74	14	326	69
	Merthyr Tydfil -	58,080	16	3	17	7	3	—	6	2	42	12
	Swansea - -	90,349	1	—	3	2	7	3	8	5	19	10
	Totals, 83 Districts	12,312,200	4,112	1,212	4,069	987	3,959	992	4,642	1,162	16,782	4,353

* Did not commence to send in Returns until week ended 28th July 1894.

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

1st Quarter.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
I.	London (*Administrative County*)	4,232,118	4	646	27	677	145
II. South-Eastern.	Croydon	102,695	—	14	1	15	4
	Dover	33,300	—	1	—	1	1
	Eastbourne	34,969	—	2	—	2	—
	Bournemouth	37,781	—	—	—	—	1
	Southampton	65,325	—	16	—	16	2
	Reading	60,054	—	6	—	6	1
III. South Midland.	Willesden	61,265	—	8	—	8	3
	Hornsey	44,205	—	3	—	3	—
	Tottenham	71,343	—	22	—	22	7
	Oxford	45,742	—	6	—	6	—
	Northampton	61,012	—	6	—	6	—
	Cambridge	36,983	—	6	—	6	2
	Leyton	63,056	—	15	2	17	1
IV. Eastern.	Walthamstow	46,346	—	6	—	6	—
	West Ham	204,903	1	39	2	42	9
	Colchester	34,559	—	5	1	6	—
	Norwich	100,970	—	33	—	33	11
V. South-Western.	Exeter	37,404	—	28	1	29	3
	Plymouth	84,248	—	11	—	11	3
	Devonport	54,803	—	6	—	6	—
	Bath	51,844	—	8	—	8	1
VI. West Midland.	Bristol	221,578	—	25	—	25	11
	St. George	36,718	—	1	—	1	—
	Gloucester	39,444	—	32	—	32	3
	Burton-on-Trent	46,047	—	10	—	10	3
	Wolverhampton	82,662	—	21	—	21	1
	Walsall	71,789	—	19	—	19	3
	West Bromwich	59,474	—	19	1	20	4
	Worcester	42,908	—	26	1	27	3
	Smethwick	36,170	—	9	—	9	2
	Birmingham	478,113	—	133	1	134	25
	Aston Manor	68,639	—	9	—	9	4
	Coventry	52,724	—	3	—	3	1
VII. North Midland.	Leicester	174,624	—	51	—	51	7
	Grimsby	51,934	—	20	1	21	3
	Nottingham	213,877	—	146	—	146	29
	Derby	94,146	—	23	—	23	8

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

1st Quarter.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
VIII. North-Western.	Stockport - - -	70,263	—	7	2	9	2
	Macclesfield - - -	36,000	—	1	—	1	1
	Birkenhead - - -	99,857	—	35	—	35	3
	Wallasey - - -	33,229	—	10	—	10	—
	Liverpool - - -	517,980	105	273	27	405	81
	St. Helens (Lancs.) - -	71,288	3	50	—	53	18
	Southport - - -	41,406	—	9	—	9	2
	Wigan - - - -	55,013	14	31	20	65	6
	Warrington - - -	52,743	—	17	2	19	6
	Bolton - - - -	115,002	—	31	—	31	7
	Bury (Lancs.) - - -	57,212	—	3	2	5	2
	Salford - - - -	198,139	—	74	4	78	16
	Manchester - - -	505,368	—	128	—	123	27
	Ashton-under-Lyne - -	40,463	—	2	3	5	1
	Oldham - - - -	131,463	—	14	—	14	3
	Accrington - - -	38,603	—	6	—	6	2
	Burnley - - - -	87,016	—	20	—	20	7
	Blackburn - - -	120,064	—	48	—	48	7
	Darwen - - - -	34,192	—	7	—	7	1
	Preston - - - -	107,573	—	27	—	27	7.
	Barrow-in-Furness - -	51,712	—	6	8	14	1
IX. Yorkshire.	Huddersfield - - -	95,120	—	5	1	6	2
	Halifax - - - -	89,832	—	20	1	21	1
	Bradford - - -	216,361	—	56	—	56	11
	Wakefield - - -	33,146	—	6	—	6	—
	Barnsley - - -	35,427	—	47	—	47	6
	Sheffield - - - -	324,243	—	98	4	102	17
	Rotherham - - -	42,061	—	4	—	4	5
	York - - - -	67,004	—	20	—	20	—
	Hull - - - -	200,044	—	45	6	51	9
	Middlesbrough - - -	75,532	—	52	8	60	8
X. Northern.	Darlington - - -	38,060	—	15	—	15	4
	Hartlepool - - -	21,271	—	3	1	4	—
	West Hartlepool - -	42,710	—	10	—	10	3
	Sunderland - - -	131,015	1	50	5	56	19
	South Shields - - -	78,391	—	14	1	15	8
	Newcastle-on-Tyne - -	186,300	—	30	2	32	7
	Tynemouth - - -	46,588	—	13	1	14	3
	Carlisle - - - -	39,176	1	—	2	3	—
	Cardiff - - - -						
XI. Welsh.		54,707	—	11	—	11	1
		128,915	1	14	—	15	5
		58,080	—	16	2	18	3
		90,349	—	35	—	35	5
		11,894,090	130	2,797	140	3,067	618

1894.

2ND QUARTER.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
I.	London - - - - (*Administrative County.*)	4,232,118	6	550	39	595	131
II. South Eastern.	Croydon - - - -	102,695	—	9	—	9	1
	Dover - - - -	33,300	—	—	1	1	2
	Eastbourne - - -	34,969	—	8	—	8	3
	Bournemouth - - -	37,781	—	2	—	2	—
	Southampton - - -	65,325	—	7	1	8	—
	Reading - - - -	60,054	—	6	—	6	1
III. South Midland.	Willesden - - -	61,265	—	15	—	15	—
	Hornsey - - - -	44,205	—	5	—	5	3
	Tottenham - - -	71,343	—	21	—	21	2
	Oxford - - - -	45,742	—	2	—	2	—
	Northampton - - -	61,012	—	8	—	8	2
	Cambridge - - -	36,983	—	5	1	6	—
	Leyton - - - -	63,056	—	8	3	11	2
IV. Eastern.	Walthamstow - - -	46,346	—	7	—	7	1
	West Ham - - -	204,903	—	46	3	49	10
	Colchester - -	34,559	—	2	—	2	—
	Norwich - - - -	100,970	—	19	—	19	2
V. South-Western.	Exeter - - - -	37,404	—	7	1	8	2
	Plymouth - - -	84,248	—	7	—	7	1
	Devonport - - -	54,803	—	8	—	8	3
	Bath - - - -	51,844	—	4	—	4	1
VI. West Midland.	Bristol - - - -	221,578	—	14	—	14	2
	St. George - - -	36,718	—	2	—	2	—
	Gloucester - - -	39,444	—	10	1	11	2
	Burton-on-Trent - -	46,047	1	3	—	4	3
	Wolverhampton - -	82,662	—	19	1	20	2
	Walsall - - - -	71,789	—	12	1	13	1
	West Bromwich - -	59,474	—	20	1	21	1
	Worcester - - -	42,908	—	7	1	8	—
	Smethwick - - -	36,170	—	4	—	4	1
	Birmingham - - -	478,113	—	89	2	91	22
	Aston Manor - - -	68,639	—	3	—	3	—
	Coventry - - -	52,724	—	1	—	1	—
North Midland.	Leicester - - -	174,624	—	33	—	33	5
	Grimsby - - - -	51,934	—	14	1	15	2
	Nottingham - - -	213,877	—	35	—	35	8
	Derby - - - -	94,146	—	14	—	14	3

APP. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

2ND QUARTER.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
VIII. North-Western.	Stockport - - -	70,263	—	1	—	1	—
	Macclesfield - - -	36,000	—	4	1	5	—
	Birkenhead - - -	99,857	2	50	—	52	5
	Wallasey - - -	33,229	—	23	—	23	—
	Liverpool - - -	517,980	61	346	28	435	68
	St. Helens (Lancs.) - -	71,288	1	21	—	22	4
	Southport - - -	41,406	—	7	—	7	—
	Wigan - - - -	55,013	6	12	3	21	1
	Warrington - - -	52,743	—	5	—	5	—
	Bolton - - - -	115,002	—	21	—	21	4
	Bury (Lancs.) - - -	57,212	2	48	5	55	10
	Salford - - - -	198,139	—	70	8	78	18
	Manchester - - -	505,368	1	75	—	76	16
	Ashton-under-Lyne - -	40,463	—	3	1	4	1
	Oldham - - - -	131,463	—	19	—	19	5
	Accrington - - -	38,603	—	6	—	6	1
	Burnley - - - -	87,016	—	37	—	37	6
	Blackburn - - -	120,064	—	30	4	34	8
	Darwen - - - -	34,192	—	12	—	12	3
	Preston - - - -	107,573	—	20	—	20	6
	Barrow-in-Furness - -	51,712	—	10	—	10	1
IX. Yorkshire.	Huddersfield - - -	95,420	1	6	—	7	4
	Halifax - - - -	89,832	—	7	1	8	—
	Bradford - - -	216,361	—	24	—	24	3
	Wakefield - - -	33,146	—	3	—	3	—
	Barnsley - - - -	35,427	1	11	—	12	4
	Sheffield - - - -	324,243	—	77	2	79	15
	Rotherham - - -	42,061	—	19	—	19	8
	York - - - -	67,004	—	11	1	12	1
	Hull - - - -	200,044	—	45	2	47	7
	Middlesbrough - - -	75,532	—	55	2	57	8
X. Northern.	Darlington - - -	38,060	—	8	—	8	—
	Hartlepool - - -	21,271	—	—	—	—	—
	West Hartlepool - -	42,710	—	4	—	4	1
	Sunderland - - -	131,015	1	38	15	54	5
	South Shields - - -	78,391	—	13	3	16	1
	Newcastle-on-Tyne - -	186,300	—	26	5	31	5
	Tynemouth - - -	46,588	—	3	—	3	—
	Carlisle - - - -	39,176	—	2	1	3	—
XI. Welsh.	Newport (Mon.) - -	54,707	—	22	—	22	2
	Cardiff - - - -	128,915	—	18	—	18	2
	Merthyr Tydfil - - -	58,080	—	16	—	16	
	Swansea - - - -	90,349	—	18	—	18	—
	Totals, 81 Districts - -	11,304,990	83	2,272	139	2,494	415

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1891.

3RD QUARTER.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
I.	London - - - - - (*Administrative County.*)	4,232,118	3	708	42	753	111
II. South-Eastern.	Croydon - - - -	102,695	—	6	2	8	—
	Dover - - - -	33,300	—	9	—	9	—
	Eastbourne - - -	34,969	—	2	—	2	—
	Bournemouth - - -	37,781	—	1	—	1	—
	Southampton - - -	65,325	—	28	—	28	6
	Reading - - - -	60,054	—	4	—	4	3
III. South Midland.	Willesden - - -	61,265	—	11	—	11	2
	Hornsey - - - -	44,205	—	10	—	10	—
	Tottenham - - -	71,343	—	36	1	37	2
	Oxford - - - -	45,712	—	—	1	1	—
	Northampton - - -	61,012	—	13	—	13	4
	Cambridge - - -	36,983	—	6	1	7	—
	Leyton - - - -	63,056	—	24	2	26	3
IV. Eastern.	Walthamstow - - -	46,346	—	16	3	19	4
	West Ham - - -	204,903	1	58	2	61	12
	Colchester - - -	34,559	—	5	—	5	—
	Norwich - - - -	100,970	—	32	1	33	2
V. South-Western.	Exeter - - - -	37,404	—	11	1	12	2
	Plymouth - - -	84,248	—	10	—	10	1
	Devonport - - -	54,803	—	10	—	10	5
	Bath - - - -	51,844	—	6	—	6	1
VI. West Midland.	Bristol - - - -	221,578	—	15	—	15	3
	St. George - - -	36,718	—	4	—	4	—
	Gloucester - - -	39,444	—	2	—	2	1
	Burton-on-Trent - -	46,047	—	5	—	5	1
	Wolverhampton - -	82,662	—	34	—	34	6
	Walsall - - - -	71,789	—	14	1	15	2
	West Bromwich - -	59,474	—	23	—	23	4
	Worcester - - -	42,908	—	12	—	12	2
	Smethwick - - -	36,170	—	5	—	5	1
	Birmingham - - -	478,113	—	127	2	129	27
	Aston Manor - - -	68,639	—	8	—	8	1
	Coventry - - -	52,724	—	7	1		5
VII. North Midland.	Leicester - - -	174,624	—	104	—	104	12
	Grimsby - - - -	51,934	4	74	2	80	13
	Nottingham - - -	213,877	—	65	—	65	10
	Derby - - - -	94,146	—	18	—	18	3

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

3rd Quarter.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
VIII.—North-Western.	Stockport - - -	70,263	—	35	—	35	4
	Macclesfield - - -	36,000	—	3	1	4	1
	Birkenhead - - -	90,857	4	43	—	47	8
	Wallasey - - -	33,229	—	22	—	22	—
	Liverpool - - -	517,980	70	384	22	476	67
	St. Helens (Lancs.) - -	71,288	—	57	1	58	5
	Southport - - -	41,406	—	9	—	9	—
	Wigan - - - -	55,013	6	10	4	20	4
	Warrington - - -	52,743	—	5	—	5	—
	Bolton - - - -	115,002	—	27	—	27	5
	Bury (Lancs.) - - -	57,212	8	14	18	40	20
	Salford - - - -	198,139	—	82	5	87	13
	Manchester - - -	505,368	—	119	—	119	18
	Ashton-under-Lyne - -	40,463	—	10	—	10	1
	Oldham - - - -	131,463	—	13	—	13	3
	Accrington - -	38,603	—	3	—	3	—
	Burnley - - -	87,016	1	30	—	31	6
	Blackburn - - -	120,064	—	18	—	18	12
	Darwen - - - -	34,192	1	11	—	12	5
	Preston - - - -	107,573	—	34	—	34	7
	Barrow-in-Furness - -	51,712	—	6	3	9	2
IX.—Yorkshire.	Huddersfield - - -	95,420	—	11	—	11	1
	Halifax - - - -	89,832	—	16	—	16	2
	Bradford - - -	216,361	—	26	—	26	8
	Leeds* - - - -	367,505	—	102	4	106	13
	Wakefield - - -	33,146	—	8	—	8	—
	Barnsley - - -	35,427	—	29	—	29	6
	Sheffield - - -	324,243	—	132	12	144	18
	Rotherham - - -	42,061	1	16	—	17	2
	York - - - -	67,004	—	29	2	31	2
	Hull - - - -	200,044	—	80	8	88	14
	Middlesbrough - -	75,532	—	43	1	44	4
X.—Northern.	Darlington - - -	38,060	—	15	—	15	2
	Stockton-on-Tees* - -	49,705	—	10	5	15	—
	Hartlepool - - -	21,271	—	3	1	4	—
	West Hartlepool - -	42,710	—	15	—	15	1
	Sunderland - - -	131,015	6	259	38	303	27
	South Shields - - -	78,391	—	22	2	24	4
	Newcastle-on-Tyne - -	186,300	—	25	9	34	2
	Tynemouth - - -	46,588	—	7	—	7	2
	Carlisle - - - -	39,176	—	4	—	4	—
XI. Welsh.	Newport (Mon.) - -	54,707	—	5	—	5	—
	Cardiff - - - -	128,915	—	14	—	14	1
	Merthyr Tydfil - - -	58,030	—	41	—	41	6
	Swansea - - -	90,340	—	19	—	19	2
	Totals, 83 Districts - -	12,312,200	105	3,389	198	3,692	547

* Did not commence to send in Returns until week ended 28th July 1894.

1894.

4th Quarter.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
I.	London - - - - (*Administrative County.*)	4,232,118	8	1,467	54	1,529	266
II. South-Eastern.	Croydon - - - -	102,696	—	27	—	27	2
	Dover - - - -	33,300	—	3	—	3	—
	Eastbourne - - -	34,969	—	3	—	3	1
	Bournemouth - - -	37,781	—	5	1	6	1
	Southampton - - -	65,325	3	23	—	26	4
	Reading - - - -	60,054	—	2	—	2	—
III. South Midland.	Willesden - - -	61,265	—	36	—	36	7
	Hornsey - - - -	44,205	—	22	3	25	3
	Tottenham - - -	71,343	—	33	—	33	7
	Oxford - - - -	45,742	—	16	—	16	2
	Northampton - - -	61,012	—	14	—	14	1
	Cambridge - - -	36,983	—	9	—	9	2
	Leyton - - - -	63,056	—	44	6	50	5
IV. Eastern.	Walthamstow - - -	46,346	—	40	1	41	4
	West Ham - - -	204,903	1	89	3	93	14
	Colchester - - -	34,559	—	11	3	14	6
	Norwich - - - -	100,970	1	65	—	66	8
V. South-Western.	Exeter - - - -	37,404	—	9	—	9	1
	Plymouth - - -	84,248	—	10	—	10	6
	Devonport - - -	54,803	—	7	—	7	1
	Bath - - - -	51,844	—	6	—	6	—
VI. West Midland.	Bristol - - - -	221,578	—	36	—	36	6
	St. George - - -	36,718	—	3	—	3	—
	Gloucester - - -	39,444	—	7	—	7	1
	Burton-on-Trent - -	46,047	—	40	1	41	6
	Wolverhampton - -	82,662	—	22	1	23	8
	Walsall - - - -	71,789	—	26	2	28	7
	West Bromwich - -	59,474	—	17	—	17	1
	Worcester - - -	42,908	—	2	—	2	—
	Smethwick - - -	36,170	—	8	—	8	2
	Birmingham - - -	478,113	—	169	3	172	32
	Aston Manor - - -	68,639	—	15	—	15	1
	Coventry - - -	52,724	—	1	—	1	1
VII. North Midland.	Leicester - - -	174,624	—	43	—	43	4
	Grimsby - - - -	51,934	—	24	1	25	9
	Nottingham - - -	213,877	—	115	—	115	15
	Derby - - - -	94,146	—	53	—	53	12

App. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

4th Quarter.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Quarter.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Quarter.	
VIII.—North-Western.	Stockport - - -	70,263	—	14	—	14	3
	Macclesfield - - -	36,000	—	9	—	9	—
	Birkenhead - - -	99,857	1	63	—	64	1
	Wallasey - - -	33,229	—	35	—	35	—
	Liverpool - - -	517,980	82	353	21	456	81
	St. Helens (Lancs.) - -	71,288	—	44	1	45	6
	Southport - - -	41,406	—	14	—	14	4
	Wigan - - - -	55,013	7	10	11	28	3
	Warrington - - -	52,743	—	2	—	2	—
	Bolton - - - -	115,002	—	40	—	40	10
	Bury (Lancs.) - - -	57,212	—	10	3	13	2
	Salford - - - -	198,139	1	99	2	102	16
	Manchester - - -	505,368	—	148	—	148	35
	Ashton-under-Lyne - -	40,463	—	4	2	6	2
	Oldham - - - -	131,463	—	23	—	23	4
	Accrington - - -	38,603	—	6	—	6	1
	Burnley - - - -	87,016	—	27	—	27	8
	Blackburn - - -	120,064	1	22	—	23	6
	Darwen - - - -	34,192	—	6	—	6	1
	Preston - - - -	107,573	—	36	—	36	9
	Barrow-in-Furness - -	51,712	—	12	6	18	5
IX. Yorkshire.	Huddersfield - - -	95,420	—	10	—	10	5
	Halifax - - - -	89,832	—	9	1	10	3
	Bradford - - -	216,361	—	35	2	37	8
	Leeds* - - - -	367,505	—	82	2	84	14
	Wakefield - - -	33,146	—	6	—	6	—
	Barnsley - - -	35,427	—	39	1	40	5
	Sheffield - - - -	324,243	—	66	4	70	14
	Rotherham - - -	42,061	—	13	1	14	4
	York - - - -	67,004	—	31	1	32	3
	Hull - - - -	200,044	—	53	6	59	10
	Middlesbrough - - -	75,532	—	45	7	52	4
X. Northern.	Darlington - - -	38,060	—	15	—	15	3
	Stockton-on-Tees* - -	49,705	—	16	12	28	2
	Hartlepool - - -	21,271	—	4	1	5	—
	West Hartlepool - -	42,710	—	12	—	12	2
	Sunderland - - -	131,015	4	240	23	267	31
	South Shields - - -	78,391	—	19	1	20	5
	Newcastle-on-Tyne - -	186,300	—	78	6	84	13
	Tynemouth - - -	46,588	—	8	—	8	4
	Carlisle - - - -	39,176	—	9	—	9	1
XI. Welsh.	Newport (Mon.) - -	54,707	—	8	—	8	3
	Cardiff - - - -	128,915	—	18	3	21	1
	Merthyr Tydfil - - -	58,080	—	66	1	67	11
	Swansea - - - -	90,349	—	47	—	47	5
	Totals, 83 Districts - -	12,312,200	109	4,433	197	4,730	794

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* Did not commence to send in Returns until week ended 28th July 1894.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

1894.

WHOLE YEAR.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Year.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Year.	
I.	London (*Administrative County.*)	4,232,118	21	3,371	162	3,554	653
II. South-Eastern.	Croydon	102,695	—	56	3	59	7
	Dover	33,300	—	13	1	14	3
	Eastbourne	34,969	—	15	—	15	4
	Bournemouth	37,781	—	8	1	9	2
	Southampton	65,325	3	74	1	78	12
	Reading	60,054	—	18	—	18	5
III. South Midland.	Willesden	61,265	—	70	—	70	12
	Hornsey	44,203	—	40	3	43	6
	Tottenham	71,343	—	117	1	118	18
	Oxford	45,742	—	24	1	25	2
	Northampton	61,012	—	41	—	41	7
	Cambridge	36,983	—	26	2	28	4
	Leyton	63,056	—	91	13	104	11
IV. Eastern.	Walthamstow	46,346	—	69	4	73	9
	West Ham	204,903	3	232	10	245	45
	Colchester	34,559	—	23	4	27	6
	Norwich	100,970	1	149	1	151	23
V. South-Western.	Exeter	37,404	—	55	3	58	8
	Plymouth	84,248	—	38	—	38	11
	Devonport	54,803	—	31	—	31	9
	Bath	51,844	—	24	—	24	3
VI. West Midland.	Bristol	221,578	—	90	—	90	22
	St. George	36,718	—	10	—	10	—
	Gloucester	39,444	—	51	1	52	7
	Burton-on-Trent	46,047	1	58	1	60	13
	Wolverhampton	82,662	—	96	2	98	17
	Walsall	71,789	—	71	4	75	13
	West Bromwich	59,474	—	79	2	81	10
	Worcester	42,908	—	47	2	49	5
	Smethwick	33,170	—	26	—	26	6
	Birmingham	478,113	—	518	8	526	106
	Aston Manor	68,639	—	35	—	35	6
	Coventry	52,724	—	12	1	13	7
VII. North Midland.	Leicester	174,624	—	231	—	231	28
	Grimsby	51,934	4	132	5	141	27
	Nottingham	213,877	—	361	—	361	62
	Derby	94,146	—	108	—	108	26

1894.

WHOLE YEAR.

APP. A. No. 13.

Compilation of Returns of Notified Infectious Diseases, and registered Deaths therefrom.

In Registration Divisions.	Urban Sanitary Districts.	Population (1891).	Fever Notifications.				Deaths from "Fever" in the Year.
			Typhus.	Enteric.	Simple and Ill-defined.	Total for whole Year.	
VIII. North-Western.	Stockport - - -	70,263	—	57	2	59	9
	Macclesfield - - -	36,000	—	17	2	19	2
	Birkenhead - - -	99,857	7	191	—	198	17
	Wallasey - - -	33,229	—	90	—	90	—
	Liverpool - - -	517 980	318	1,356	98	1,772	297
	St. Helens (Lancs.) - -	71,288	4	172	2	178	33
	Southport - - -	41,406	—	39	—	39	6
	Wigan - - - -	55,013	33	63	38	134	14
	Warrington - - -	52,743	—	29	2	31	6
	Bolton - - - -	115,002	—	119	—	119	28
	Bury (Lancs.) - - -	57,212	10	75	28	113	34
	Salford - - - -	198,139	1	325	19	345	63
	Manchester - - -	505,368	1	470	—	471	96
	Ashton-under-Lyne - -	40,463	—	19	6	25	5
	Oldham - - - -	131,463	—	69	—	69	15
	Accrington - - -	38,603	—	21	—	21	4
	Burnley - - - -	87,016	1	114	—	115	27
	Blackburn - - -	120,064	1	118	4	123	33
	Darwen - - - -	34,192	1	36	—	37	10
	Preston - - - -	107,573	—	117	—	117	20
	Barrow-in-Furness - -	51,712	—	34	17	51	9
IX. Yorkshire.	Huddersfield - - -	95,420	1	32	1	34	12
	Halifax - - - -	89,832	—	52	3	55	6
	Bradford - - -	216,361	—	141	2	143	30
	Leeds* - - - -	367,505	—	184	6	190	27
	Wakefield - - -	33,146	—	23	—	23	—
	Barnsley - - - -	35,427	1	126	1	128	21
	Sheffield - - - -	324,243	—	373	22	395	64
	Rotherham - - -	42,061	1	52	1	54	19
	York - - - -	67,004	—	91	4	95	6
	Hull - - - -	200,044	—	223	22	245	40
	Middlebrough - - -	75,532	—	195	18	213	24
X. Northern.	Darlington - - -	38,060	—	53	—	53	9
	Stockton-on-Tees* - -	49,705	—	26	17	43	2
	Hartlepool - - -	21,271	—	10	3	13	—
	West Hartlepool - -	42,710	—	41	—	41	7
	Sunderland - - -	131,015	12	587	81	680	82
	South Shields - - -	78,391	—	68	7	75	18
	Newcastle-on-Tyne - -	186,300	—	159	22	181	27
	Tynemouth - - -	46,588	—	31	1	32	9
	Carlisle - - - -	39,176	1	15	3	19	1
XI. Welsh.	Newport (Mon.) - -	54,707	—	46	—	46	6
	Cardiff - - - -	128,915	1	64	3	68	9
	Merthyr Tydfil - - -	58,080	—	139	3	142	23
	Swansea - - - -	90,349	—	119	—	119	12
	Totals 83 Districts - -	12,312,200	427	12,891	674	13,992	2,404

* Did not commence to send in Returns until week ended 28th July 1894.

No. 13 (*a*).

TABLE showing, Week by Week, during the Year 1894, for each of the SANITARY AREAS within the CASES of and of REGISTERED DEATHS from the under-mentioned DISEASES, together with

[The Cases are copied from the Weekly Returns of Notifiable Diseases received by the Board from the Metropolitan

	Sanitary Areas.	Population (1891).	SMALL-POX.											
			Weekly Statement, 1st Quarter, 1894.											
			Jan. 6.		Jan. 13.		Jan. 20.		Jan. 27.		Feb. 3.		Feb. 10.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]14	1	17	1	7	—	13	—	13	1	16	—
	(*Administrative County*)	-	[b]*14*	—	*15*	—	*6*	—	*13*	—	*12*	—	*15*	—
W. District.	Kensington	166,308	3	—	—	—	—	—	4	—	—	—	—	—
	Fulham	91,639	—	—	—	—	—	—	—	—	2	—	3	—
	Hammersmith	97,239	1	—	1	—	—	—	—	—	—	—	—	—
	Paddington	117,846	1	—	1	1	—	—	1	—	—	—	—	—
	Chelsea	96,253	—	—	1	—	—	—	—	—	2	—	1	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—	—	—	—	—
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	2	—	—	—	—	—	—	—	—	—
	Islington	319,143	—	—	—	—	—	—	—	—	—	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	1	—	—	—	—	—	1	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	1	—	—	—	—	—	—	—	1	—
	St. Luke, Middlesex	42,440	1	—	1	—	—	—	—	—	—	—	—	—
	London, City of §	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	—	—	1	—	—	—	—	—
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—	1	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	2	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	1	4	—	1	—	—	—	1	—	2	—
	Poplar	166,748	3	—	1	—	1	—	5	—	2	1	3	—
S. District.	St. Saviour, Southwark	27,177	—	—	1	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	1	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	—	—	—	—	—	—	—	—	1	—
	Battersea	150,558	—	—	1	—	—	—	—	—	1	—	—	—
	Wandsworth	156,942	—	—	—	—	1	—	—	—	—	—	—	—
	Camberwell	235,344	—	—	—	—	1	—	—	—	—	—	—	—
	Greenwich	165,413	4	—	1	—	—	—	—	—	3	—	1	—
	Lewisham	92,647	—	—	—	—	1	—	—	—	—	—	2	—
	Woolwich	40,848	—	—	—	—	2	—	—	—	2	—	—	—
	Plumstead	72,158	—	—	—	—	—	—	—	—	—	—	1	—
	Lee	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 285). † Including Middle Temple (population, 95).

No. 13 (*a*).

ADMINISTRATIVE COUNTY of LONDON and for the COUNTY as a WHOLE, the NUMBER of NOTIFIED
QUARTERLY and ANNUAL SUMMARIES of these Data for each of the AREAS in question.
Asylums Board. The Deaths are extracted from the Weekly Returns compiled by the Registrar-General.]

SMALL-POX—*continued.*

Weekly Statement, 1st Quarter, 1894—*continued.*														Totals for 1st Quarter, 1894.		Sanitary Areas.
Feb. 17.		Feb. 24.		March 3.		March 10.		March 17.		March 24.		March 31.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
18	—	18	2	19	1	23	—	7	1	16	—	17	—	198	7	London.
16	—	*18*	—	*15*	—	*21*	—	*7*	—	*16*	—	*16*	—	*184*	—	(*Administrative County.*)
—	—	1	—	1	—	—	—	—	—	—	—	—	—	9	—	Kensington.
7	—	2	—	6	—	—	—	1	—	1	—	1	—	23	—	Fulham.
—	—	3	—	5	—	—	—	—	—	—	—	—	—	10	—	Hammersmith.
1	—	—	—	1	—	—	—	—	—	—	—	—	—	5	1	Paddington.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	5	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. James, Westminster.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	Hampstead.
—	—	1	—	1	—	1	—	—	—	2	—	1	—	8	—	St. Pancras.
—	—	—	—	—	—	5	—	—	—	—	—	1	—	6	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
—	—	1	—	2	—	—	—	1	—	—	—	1	—	7	—	Hackney.
—	—	—	—	—	—	2	—	—	—	—	—	—	—	2	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	1	—	—	—	1	—	—	—	4	—	Clerkenwell.
—	—	—	—	—	—	1	—	—	—	—	—	1	—	4	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
1	—	—	—	—	—	1	—	1	—	1	—	—	—	4	—	Shoreditch.
2	—	—	—	—	—	2	—	—	—	1	—	—	—	6	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	St. George-in-the-East.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	3	—	Limehouse.
—	—	—	—	—	—	4	—	—	—	—	—	—	—	12	1	Mile End Old Town.
2	—	1	—	—	—	4	—	1	—	2	—	6	—	31	1	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
1	—	—	—	—	—	—	—	—	—	1	—	1	—	4	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Rotherhithe.
—	—	—	—	—	—	—	—	—	—	2	—	—	—	3	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Battersea.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Camberwell.
—	—	2	—	—	—	—	—	1	—	—	—	—	—	12	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Lewisham.
1	—	—	1	1	—	—	—	1	—	—	—	—	—	7	1	Woolwich.
2	—	7	—	2	—	1	—	—	1	2	—	1	—	16	1	Plumstead.
—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	2	Lee.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	SMALL-POX—*continued.*											
			Weekly Statement, 2nd Quarter, 1894.											
			April 7.		April 14.		April 21.		April 28.		May 5.		May 12.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - - -	4,232,118	[a]27	2	36	—	48	3	27	4	43	—	54	3
	(*Administrative County*) -	-	[b]*25*	—	*32*	—	*43*	—	*25*	—	*36*	—	*53*	—
W. District.	Kensington - - -	166,308	1	—	—	—	—	—	—	—	—	—	1	—
	Fulham - - -	91,639	1	—	1	—	1	1	—	—	—	—	—	—
	Hammersmith - -	97,239	—	—	—	—	1	—	—	—	—	—	—	—
	Paddington - - -	117,846	—	—	—	—	—	—	—	—	—	—	—	—
	Chelsea - - -	96,253	1	—	—	—	—	—	1	—	—	—	1	—
	St. George, Hanover Sq.* -	78,509	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster - -	55,539	—	—	1	—	—	—	—	—	—	—	—	—
	St. James, Westminster -	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone - -	142,404	1	—	—	—	1	—	1	—	—	—	—	—
	Hampstead - - -	68,416	—	1	—	—	1	—	—	—	—	—	—	—
	St. Pancras - - -	234,379	2	—	2	—	3	—	4	—	1	—	4	—
	Islington - - -	319,143	8	1	2	—	17	—	4	—	7	—	10	1
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	1	—	—	—
	Hackney - - -	198,606	—	—	1	—	2	—	1	—	3	—	2	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	2	—	—	—	—	—	2	—	1	—
	St. Martin-in-the-Fields -	14,616	—	—	—	—	1	—	—	—	—	—	—	—
	Strand† - - -	25,217	—	—	1	—	—	—	—	—	—	—	1	—
	Holborn‡ - - -	34,043	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell - - -	66,216	1	—	—	—	—	—	—	—	—	—	1	—
	St. Luke, Middlesex -	42,440	—	—	1	—	1	—	—	1	3	—	1	—
	London, City of§ - -	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch - - -	124,009	2	—	—	—	3	—	1	1	—	—	3	—
	Bethnal Green - -	129,132	—	—	2	—	1	—	2	—	1	—	6	—
	Whitechapel‖ - -	74,420	1	—	—	—	1	—	—	—	—	—	—	—
	St. George-in-the-East -	45,795	—	—	—	—	—	—	1	—	—	—	—	—
	Limehouse - - -	57,376	—	—	1	—	—	—	1	—	1	—	2	-
	Mile End Old Town -	107,592	1	—	2	—	1	—	2	—	5	—	—	-
	Poplar - - -	166,748	3	—	6	—	7	1	3	—	16	—	14	2
S. District.	St. Saviour, Southwark -	27,177	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark -	59,712	1	—	—	—	—	—	—	—	—	—	2	—
	Newington - - -	115,804	1	—	4	—	—	1	—	—	—	—	—	—
	St. Olave, Southwark -	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey - -	84,682	—	—	1	—	1	—	—	1	—	—	1	—
	Rotherhithe - - -	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth - - -	275,203	2	—	1	—	2	—	3	—	1	—	1	—
	Battersea - - -	150,558	1	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth - -	156,942	—	—	1	—	—	—	—	—	—	—	—	—
	Camberwell - - -	235,344	—	—	3	—	1	—	1	1	1	—	2	—
	Greenwich - - -	165,413	—	—	1	—	—	—	1	—	1	—	—	—
	Lewisham - - -	92,647	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich - - -	40,848	—	—	—	—	1	—	1	—	—	—	1	—
	Plumstead - - -	72,158	—	—	—	—	1	—	—	—	—	—	—	—
	Lee - - - -	16,381	—	—	1	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	2	—	1	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SMALL-POX—*continued.*

Weekly Statement, 2nd Quarter, 1894—*continued.*

May 19.		May 26.		June 2.		June 9.		June 16.		June 23.		June 30.		Totals for 2nd Quarter, 1894.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
34	3	64	7	60	4	34	3	47	—	19	5	17	—	510	34	London.
32	—	*61*	—	*48*	—	*31*	—	*40*	—	*19*	—	*15*	—	*461*	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Kensington.
—	—	1	—	2	—	—	—	—	—	—	—	—	—	6	1	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hammersmith.
—	—	—	—	2	—	—	—	—	—	—	—	—	—	2	—	Paddington.
—	—	—	—	1	—	2	—	—	—	—	—	1	—	7	—	Chelsea.
—	—	3	—	—	—	1	—	—	—	—	—	—	—	4	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Westminster.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	St. James, Westminster.
1	—	—	—	—	—	—	—	—	—	—	—	1	—	5	—	St. Marylebone.
—	—	—	—	—	—	—	—	4	—	—	—	—	—	5	1	Hampstead.
6	—	2	3	15	—	4	1	1	—	1	—	1	—	46	4	St. Pancras.
6	—	9	—	3	—	5	—	9	—	2	—	—	—	82	2	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Mary, Stoke Newington.
4	—	8	—	1	1	—	—	—	—	—	—	—	—	22	1	Hackney.
—	—	—	1	—	—	—	—	—	—	—	—	—	—	5	1	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Martin-in-the-Fields.
—	—	3	—	—	—	—	—	—	—	—	—	—	—	5	—	Strand.†
—	—	—	—	—	—	—	—	2	—	—	—	4	—	6	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	1	St. Luke, Middlesex.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	London, City of.§
—	—	4	—	—	—	—	—	1	—	1	—	1	—	16	1	Shoreditch.
3	—	12	—	11	—	6	1	13	—	5	2	6	—	68	3	Bethnal Green.
—	—	1	—	1	—	—	—	—	—	—	—	—	—	4	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George-in-the-East.
—	—	1	—	—	1	—	—	—	—	—	—	—	—	6	1	Limehouse.
6	1	6	1	11	1	2	—	3	—	—	—	—	—	39	3	Mile End Old Town.
5	1	10	1	—	1	7	—	6	—	5	2	2	—	84	8	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	4	—	St. George, Southwark.
—	—	1	—	3	—	1	1	4	—	—	—	1	—	15	2	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	1	Bermondsey.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	Rotherhithe.
—	—	—	—	4	—	1	—	—	—	1	—	—	—	16	—	Lambeth.
—	—	—	—	—	—	—	—	1	—	—	1	—	—	2	1	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Wandsworth.
—	1	—	—	1	—	—	—	—	—	—	—	—	—	9	2	Camberwell.
1	—	1	—	1	—	1	—	—	—	—	—	—	—	7	—	Greenwich.
—	—	1	—	—	—	—	—	—	—	1	—	—	—	2	—	Lewisham.
1	—	—	—	2	—	—	—	—	—	—	—	—	—	6	—	Woolwich.
1	—	—	1	2	—	2	—	1	—	3	—	—	—	10	1	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Lee.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	4	—	Port of London.

‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	Small-pox—*continued.* Weekly Statement, 3rd Quarter, 1894. July 7. Cases.	July 7. Deaths.	July 14. Cases.	July 14. Deaths.	July 21. Cases.	July 21. Deaths.	July 28. Cases.	July 28. Deaths.	Aug. 4. Cases.	Aug. 4. Deaths.	Aug. 11. Cases.	Aug. 11. Deaths.
	London	4,232,118	[a]29	1	10	2	14	1	175	1	79	5	25	10
	(*Administrative County*)		[b]*28*	—	*10*	—	*18*	—	*143*	—	*58*	—	*22*	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	—	—	1	—
	Fulham	91,639	—	—	—	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	1	—
	Paddington	117,846	—	—	—	—	—	—	2	—	6	1	—	—
	Chelsea	96,253	1	—	—	—	—	—	1	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	1	—	1	—	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	2	1
N. District.	St. Marylebone	142,404	4	—	1	1	—	—	142	—	54	3	10	7
	Hampstead	68,416	—	—	—	—	—	—	4	—	1	—	5	2
	St. Pancras	234,379	5	1	1	—	1	—	11	—	5	1	2	—
	Islington	319,143	1	—	1	—	1	—	1	—	3	—	—	—
	St. Mary, Stoke Newington	30,936	1	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	1	—	—	—	—	—	—	—	1	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	2	—	—	—	—	—	1	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	1	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex	42,440	3	—	—	—	1	—	—	—	1	—	—	—
	London, City of §	37,583	—	—	—	—	—	—	1	—	—	—	—	—
E. District.	Shoreditch	124,009	3	—	1	1	1	—	1	—	—	—	—	—
	Bethnal Green	129,132	5	—	3	—	2	1	6	—	2	—	—	—
	Whitechapel‖	74,420	—	—	—	—	3	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	1	—	1	—	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	1	—	1	—	1	1	—	—	—	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	1	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	1	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	—	—	—	—	2	—	1	—	2	—
	Battersea	150,558	—	—	—	—	—	—	—	—	2	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	—	—
	Camberwell	235,344	1	—	—	—	—	—	—	—	2	—	1	—
	Greenwich	165,413	1	—	—	—	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	1	—	—	—	—	—
	Plumstead	72,158	1	—	—	—	—	—	1	—	1	—	—	—
	Lee	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 25).

SMALL-POX—*continued.*

Weekly Statement, 3rd Quarter, 1894—*continued.*														Totals for 3rd Quarter, 1894.		Sanitary Areas.
Aug. 18.		Aug. 25.		Sept. 1.		Sept. 8.		Sept. 15.		Sept. 22.		Sept. 29.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
51	4	38	2	95	7	18	6	26	3	22	—	16	1	598	43	London.
47	—	*27*	—	*51*	—	*15*	—	*20*	—	*20*	—	*15*	—	*469*	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	6	—	2	—	1	—	10	—	Kensington.
1	—	—	—	4	—	5	1	—	1	2	—	1	—	13	2	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Hammersmith.
1	—	—	—	1	—	1	—	—	—	—	—	1	—	12	1	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Chelsea.
—	—	1	—	—	—	4	—	—	—	1	—	—	—	8	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	St. James, Westminster.
34	2	30	1	76	6	2	4	13	1	4	—	6	1	376	26	St. Marylebone.
—	—	1	—	3	—	—	—	—	—	—	—	—	—	14	2	Hampstead.
2	1	2	—	2	—	3	1	5	—	3	—	—	—	43	4	St. Pancras.
2	—	—	—	2	—	—	—	—	1	2	—	2	—	15	1	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Mary, Stoke Newington
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
2	—	1	—	—	—	1	—	—	—	1	—	—	—	6	—	Holborn.‡
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Clerkenwell.
1	—	1	—	—	—	—	—	—	—	—	—	—	—	7	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	London, City of.§
1	—	—	—	—	—	—	—	—	—	1	—	—	—	8	1	Shoreditch.
2	—	—	1	2	—	—	—	—	—	1	—	—	—	23	2	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Mile End Old Town.
1	—	—	—	1	—	—	—	—	—	—	—	2	—	7	1	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	2	—	—	—	2	—	St. George, Southwark.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Bermondsey.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Rotherhithe.
1	1	—	—	—	—	—	—	1	—	—	—	—	—	7	1	Lambeth.
1	—	—	—	3	1	—	—	—	—	—	—	1	—	7	1	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	5	—	Camberwell.
—	—	—	—	1	—	—	—	1	—	—	—	—	—	3	—	Greenwich.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	2	—	2	—	5	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lee.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 135), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	SMALL-POX—*continued.* Weekly Statement, 4th Quarter, 1894. Oct. 6. Cases.	Deaths.	Oct. 13. Cases.	Deaths.	Oct. 20. Cases.	Deaths.	Oct. 27. Cases.	Deaths.	Nov. 3. Cases.	Deaths.	Nov. 10. Cases.	Deaths.	Nov. 17. Cases.	Deaths.
	London	4,232,118	[a]13	1	10	—	8	—	10	—	9	1	11	1	3	—
	(*Administrative County*)		[b]*13*	—	*9*	—	*8*	—	*8*	—	*9*	—	*11*	—	*3*	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Fulham	91,639	2	—	1	—	1	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Paddington	117,846	—	—	2	—	—	—	2	—	2	—	4	1	—	—
	Chelsea	96,253	—	—	—	—	1	—	1	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	1	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	2	1	1	—	1	—	4	—	6	—	3	—	1	—
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	2	—	—	—	1	—	3	—	1	—	2	—	—	—
	Islington	319,143	1	—	—	—	—	—	—	—	—	—	1	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	1	—	—	—	—	—	—	—	—	—	1	—
	Bethnal Green	129,132	—	—	—	—	1	—	—	—	—	—	—	—	—	—
	Whitechapel ‖	74,420	—	—	1	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District.	St. Saviour, Southwark	27,177	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	2	—	—	—	—	—	—	—	1	—
	Lambeth	275,203	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	Battersea	150,558	—	—	2	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Camberwell	235,344	1	—	—	—	—	—	—	—	—	—	1	—	—	—
	Greenwich	165,413	2	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	2	—	—	—	—	—	—	—	—	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Plumstead	72,158	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lee	16,331	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SMALL-POX—*continued.*

Weekly Statement, 4th Quarter, 1894—*continued.* Nov. 24. Cases.	Nov. 24. Deaths.	Dec. 1. Cases.	Dec. 1. Deaths.	Dec. 8. Cases.	Dec. 8. Deaths.	Dec. 15. Cases.	Dec. 15. Deaths.	Dec. 22. Cases.	Dec. 22. Deaths.	Dec. 29. Cases.	Dec. 29. Deaths.	Totals for 4th Quarter, 1894. Cases.	Totals for 4th Quarter, 1894. Deaths.	Grand Totals for Year 1894. Cases.	Grand Totals for Year 1894. Deaths.	Sanitary Areas.
2	—	4	—	12	—	3	—	3	1	2	1	90	5	1,396	89	London.
2	—	*4*	—	*9*	—	*3*	—	*3*	—	*2*	—	*84*	—	*1,198*	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	—	—	—	—	—	—	21	—	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—	4	—	46	3	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—	10	1	29	3	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	16	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	1	12	1	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	1	St. James, Westminster.
—	—	3	—	10	—	2	—	1	1	1	1	35	3	417	29	St. Marylebone.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	22	3	Hampstead.
—	—	—	—	—	—	—	—	1	—	—	—	10	—	106	8	St. Pancras.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	105	3	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	St. Mary, Stoke Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	31	1	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	1	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	1	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	London, City of.§
—	—	—	—	—	—	—	—	—	—	—	—	2	—	30	2	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	98	5	Bethnal Green.
1	—	—	—	1	—	—	—	—	—	—	—	3	—	11	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	1	—	5	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	1	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	52	4	Mile End Old Town.
—	—	—	—	—	—	1	—	1	—	—	—	2	—	124	10	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	1	—	1	—	7	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	2	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	1	Bermondsey.
1	—	—	—	—	—	—	—	—	—	—	—	4	—	7	—	Rotherhithe.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	27	1	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	13	2	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	17	2	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	24	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	8	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	1	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	29	2	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	Lee.
—	—	—	—	1	—	—	—	—	—	—	—	2	—	8	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	Scarlet Fever. Weekly Statements, 1st Quarter, 1894. Jan. 6. Cases.	Jan. 6. Deaths.	Jan. 13. Cases.	Jan. 13. Deaths.	Jan. 20. Cases.	Jan. 20. Deaths.	Jan. 27. Cases.	Jan. 27. Deaths.	Feb. 3. Cases.	Feb. 3. Deaths.	Feb. 10. Cases.	Feb. 10. Deaths.
	London - - - - -	4,232,118	[a]486	34	416	26	458	25	417	9	369	28	407	23
	(*Administrative County*) -	- -	[b]*481*	—	*414*	—	*444*	—	*404*	—	*360*	—	*396*	—
W. District.	Kensington - - -	166,308	16	1	14	2	15	—	16	1	6	1	13	1
	Fulham - - -	91,639	8	2	8	—	24	2	10	—	10	1	10	—
	Hammersmith - -	97,239	6	—	14	—	8	—	7	1	11	—	14	1
	Paddington - - -	117,846	12	1	6	—	4	—	5	—	7	1	8	1
	Chelsea - - -	96,253	6	—	5	—	8	—	3	—	10	—	9	—
	St. George, Hanover Sq.* -	78,599	7	—	4	—	6	—	9	—	9	—	8	—
	Westminster - -	55,539	7	—	4	—	4	—	5	1	4	—	2	1
	St. James, Westminster -	24,995	1	—	1	1	5	—	2	—	—	—	1	1
N. District.	St. Marylebone - -	142,404	10	2	13	1	10	1	15	—	13	1	14	—
	Hampstead - - -	68,416	9	—	4	—	5	—	4	—	5	—	4	—
	St. Pancras - - -	234,379	25	1	24	1	19	1	35	—	9	1	20	—
	Islington - - -	319,143	37	3	31	—	36	1	25	—	26	2	19	4
	St. Mary, Stoke Newington	30,936	—	—	—	1	—	—	—	—	—	1	—	—
	Hackney - - -	198,606	26	2	38	1	27	2	40	—	26	—	27	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	2	—	1	—	3	1	2	—	4	—	2	—
	St. Martin-in-the-Fields -	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand† - - -	25,217	3	—	—	—	1	1	—	—	2	—	—	—
	Holborn‡ - - -	34,043	—	—	3	—	11	—	4	—	—	—	2	—
	Clerkenwell - - -	66,216	6	—	6	—	9	—	8	—	8	—	8	1
	St. Luke, Middlesex -	42,440	1	1	4	2	7	—	1	1	2	—	1	—
	London, City of§ - -	37,583	2	—	—	1	5	—	6	—	1	1	1	1
E. District.	Shoreditch - - -	124,009	14	1	8	1	12	—	9	1	10	1	10	1
	Bethnal Green - -	129,132	14	1	14	1	15	1	11	—	11	4	13	—
	Whitechapel‖ - -	74,420	12	3	9	1	7	—	6	2	7	—	4	—
	St. George-in-the-East -	45,795	7	—	4	—	3	1	4	—	6	2	3	—
	Limehouse - - -	57,376	3	—	1	—	7	1	9	—	2	—	7	2
	Mile End Old Town - -	107,592	11	2	16	1	22	—	9	—	21	1	17	—
	Poplar - - -	166,748	19	3	15	—	16	—	21	—	10	—	19	1
S. District.	St. Saviour, Southwark -	27,177	—	—	8	—	2	—	2	—	2	—	—	—
	St. George, Southwark -	59,712	6	—	5	—	2	1	6	1	5	—	6	—
	Newington - - -	115,804	10	—	10	3	21	1	20	—	12	—	13	1
	St. Olave, Southwark -	12,723	—	—	—	—	3	—	2	1	1	1	1	—
	Bermondsey - - -	84,682	14	1	8	1	8	—	13	—	5	—	4	—
	Rotherhithe - - -	39,255	13	—	7	1	3	—	6	—	11	—	2	1
	Lambeth - - -	275,203	29	2	26	—	20	2	17	—	24	—	35	3
	Battersea - - -	150,558	18	2	18	1	19	2	18	—	11	—	26	—
	Wandsworth - - -	156,942	15	—	17	—	23	2	8	—	15	—	18	—
	Camberwell - - -	235,344	30	1	27	1	28	3	22	—	14	2	18	1
	Greenwich - - -	165,413	11	4	22	2	19	2	14	—	27	1	30	—
	Lewisham - - -	92,647	5	—	8	—	8	—	5	—	8	—	4	—
	Woolwich - - -	40,848	5	—	1	2	4	—	8	—	6	1	2	—
	Plumstead - - -	72,158	16	—	13	1	8	—	10	—	9	1	12	1
	Lee - - - -	16,381	—	1	—	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	2	—	1	—	—	—	—	—	—	—

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[a] Totals of actual notifications.

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SCARLET FEVER—*continued.*

Weekly Statement, 1st Quarter, 1894—*continued.*														Totals for 1st Quarter, 1894.		Sanitary Areas.
Feb. 17.		Feb. 24.		March 3.		March 10.		March 17.		March 24.		March 31.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
368	24	308	19	385	20	335	17	348	19	369	13	415	23	5,020	274	London.
354	—	*296*	—	*374*	—	*339*	—	*333*	—	*358*	—	*399*	—	*4,882*	—	(*Administrative County.*)
8	—	11	1	9	—	6	—	5	1	7	2	12	1	136	11	Kensington.
4	1	5	—	6	—	11	—	8	2	4	—	23	—	131	6	Fulham.
6	1	1	—	9	—	1	—	4	2	2	1	2	—	85	6	Hammersmith.
2	—	9	—	8	—	3	—	7	1	6	—	6	—	83	4	Paddington.
5	1	2	—	6	—	3	—	7	—	9	—	2	—	75	1	Chelsea.
7	—	1	—	4	—	**10	—	8	—	12	—	7	1	92	1	St. George, Hanover Sq.*
3	—	3	—	2	1	1	—	1	—	3	—	—	—	39	3	Westminster.
4	—	1	—	—	—	1	—	3	—	1	—	—	—	20	2	St. James, Westminster.
14	2	12	—	16	1	19	1	11	3	13	—	14	2	174	14	St. Marylebone.
3	—	2	—	1	1	4	—	1	—	6	—	4	—	52	1	Hampstead.
27	1	17	—	22	2	13	4	13	—	17	1	11	1	252	13	St. Pancras.
19	1	32	—	29	—	28	1	23	3	37	2	27	—	369	16	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	St. Mary, Stoke Newington.
22	—	27	2	21	1	28	2	27	—	10	—	26	—	345	11	Hackney.
7	1	1	—	2	—	2	—	1	—	4	—	2	—	33	2	St. Giles and St. George, Bloomsbury.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	2	—	St. Martin-in-the-Fields.
2	—	1	—	1	—	1	—	2	—	2	—	1	—	16	1	Strand.†
1	—	2	—	5	—	4	—	6	—	5	—	1	—	44	—	Holborn.‡
4	—	3	1	3	1	3	—	5	—	1	—	5	—	71	3	Clerkenwell.
1	—	1	—	—	—	4	—	1	—	3	—	2	—	28	4	St. Luke, Middlesex.
1	1	2	1	7	1	2	—	3	—	2	—	2	—	34	6	London, City of.§
8	2	6	1	8	—	7	—	7	—	6	1	6	—	111	9	Shoreditch.
14	1	4	—	5	1	11	—	14	—	15	—	9	1	150	10	Bethnal Green.
5	—	4	—	3	2	3	1	3	—	2	—	3	—	68	9	Whitechapel.‖
2	—	3	—	8	—	4	1	3	—	3	—	7	—	56	4	St. George-in-the-East.
8	—	5	1	5	—	7	—	5	1	6	—	11	4	76	9	Limehouse.
25	2	7	2	14	—	9	—	11	1	9	1	15	4	186	14	Mile End Old Town.
9	—	17	1	11	—	6	1	14	—	13	—	21	—	191	6	Poplar.
—	—	—	—	6	—	2	—	2	—	3	—	2	—	39	—	St. Saviour, Southwark.
8	2	1	—	12	—	6	1	5	—	7	—	7	2	76	7	St. George, Southwark.
8	—	11	—	13	—	18	—	7	—	4	1	9	—	151	6	Newington.
2	—	—	—	1	—	—	—	1	—	—	—	2	—	13	2	St. Olave, Southwark.
6	3	4	—	6	1	3	—	7	—	6	—	5	—	84	5	Bermondsey.
3	—	7	—	9	—	4	—	8	1	6	—	3	—	82	3	Rotherhithe.
23	2	19	4	42	1	24	2	41	1	22	1	26	—	346	17	Lambeth.
18	—	10	1	14	1	23	1	20	1	19	1	23	2	237	12	Battersea.
16	1	9	1	14	1	17	—	10	—	23	—	17	1	201	6	Wandsworth.
21	—	13	1	23	2	19	1	21	1	18	1	21	2	274	16	Camberwell.
29	3	23	1	26	1	14	—	16	1	37	1	35	1	366	17	Greenwich.
9	—	8	1	8	1	6	—	3	1	4	—	7	1	83	4	Lewisham.
1	—	4	—	—	—	2	—	4	—	—	—	3	—	40	3	Woolwich.
13	—	14	—	7	1	11	1	4	—	23	—	6	—	146	5	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	29	—	29	1	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 885).

** St. Peters, Westminster, 3.

	Sanitary Areas.	Population (1891).	Scarlet Fever—*continued.* Weekly Statement, 2nd Quarter, 1894. April 7.		April 14.		April 21.		April 28.		May 5.		May 12.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]389	21	358	27	450	29	497	25	408	30	408	25
	(*Administrative County*)	-	[b]*372*	—	*349*	—	*444*	—	*473*	—	*398*	—	*395*	—
W. District.	Kensington	166,308	7	—	8	—	14	—	13	2	7	—	4	—
	Fulham	91,639	12	—	4	—	7	1	13	1	10	—	15	—
	Hammersmith	97,239	3	—	3	—	10	—	4	—	4	—	9	—
	Paddington	117,846	8	1	9	—	10	—	5	1	13	—	9	—
	Chelsea	96,253	7	—	8	—	4	—	12	—	9	—	9	—
	St. George, Hanover Sq.*	78,599	5	—	3	1	14	—	11	1	11	—	4	1
	Westminster	55,539	4	—	5	—	7	—	2	—	1	1	2	—
	St. James, Westminster	24,995	2	—	—	—	—	—	1	—	3	—	2	—
N. District.	St. Marylebone	142,404	12	2	13	2	21	2	27	4	10	2	3	2
	Hampstead	68,416	1	1	1	—	3	—	5	—	2	—	6	—
	St. Pancras	234,379	34	—	32	2	20	—	26	1	19	2	21	—
	Islington	319,143	35	—	30	4	37	6	33	2	30	2	37	1
	St. Mary, Stoke Newington	30,936	3	—	2	—	2	—	10	—	2	—	4	1
	Hackney	198,606	19	1	26	2	28	3	40	2	21	7	22	3
Central District.	St. Giles and St. George, Bloomsbury.	39,782	2	—	3	—	1	—	3	—	3	—	2	—
	St. Martin-in-the-Fields	14,616	—	—	1	—	1	—	—	—	2	—	—	—
	Strand†	25,217	—	—	3	—	—	—	2	—	—	—	2	—
	Holborn‡	34,043	2	—	1	—	1	—	2	—	1	—	—	—
	Clerkenwell	66,216	4	—	1	—	5	—	5	—	6	—	1	—
	St. Luke, Middlesex	42,440	—	—	1	—	4	—	4	—	5	—	2	—
	London, City of§	37,583	5	—	4	—	4	—	4	1	2	1	3	—
E. District.	Shoreditch	124,009	8	1	8	1	9	1	15	—	4	1	11	1
	Bethnal Green	129,132	8	—	10	—	3	2	13	—	8	—	13	—
	Whitechapel‖	74,420	5	1	9	—	8	1	1	—	8	1	9	—
	St. George-in-the-East	45,795	4	—	7	—	6	—	6	1	4	—	8	1
	Limehouse	57,376	7	—	9	2	12	1	12	1	8	1	10	—
	Mile End Old Town	107,592	7	1	14	—	11	2	12	—	10	3	7	1
	Poplar	166,748	12	—	10	—	18	1	16	—	23	—	13	1
S. District.	St. Saviour, Southwark	27,177	2	—	—	—	1	1	—	1	2	—	4	—
	St. George, Southwark	59,712	10	2	2	—	8	1	7	—	4	—	12	—
	Newington	115,804	6	—	14	3	15	—	15	—	8	—	12	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	1	—	—	2	—	—
	Bermondsey	84,682	4	—	5	2	5	—	6	—	3	—	5	—
	Rotherhithe	39,255	4	—	1	—	5	1	6	—	5	—	4	1
	Lambeth	275,203	31	5	19	1	18	3	27	2	33	1	25	3
	Battersea	150,558	19	1	19	2	31	—	28	—	32	2	25	2
	Wandsworth	156,942	10	—	12	—	15	1	25	—	20	—	34	2
	Camberwell	235,344	26	—	21	1	40	—	43	—	31	—	17	2
	Greenwich	165,413	33	2	16	3	21	1	25	1	18	3	13	—
	Lewisham	92,647	10	1	10	—	12	—	6	1	8	1	12	1
	Woolwich	40,848	1	—	2	—	6	1	4	—	7	—	3	1
	Plumstead	72,158	16	2	9	1	3	—	4	—	8	—	10	1
	Lee	16,381	1	—	1	—	6	—	2	3	2	—	3	—
	Port of London	—	—	—	2	—	4	—	1	—	1	—	1	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

Scarlet Fever—*continued.*

Weekly Statement, 2nd Quarter, 1894—*continued.*														Totals for 2nd Quarter, 1894.		Sanitary Areas.
May 19.		May 26.		June 2.		June 9.		June 16.		June 23.		June 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
400	20	341	20	351	14	405	17	345	19	375	18	348	19	5,075	284	London,
393	—	*330*	—	*345*	—	*396*	—	*355*	—	*368*	—	*334*	—	*4,949*	—	(*Administrative County*)
5	—	5	—	5	—	8	—	3	—	3	—	5	—	87	2	Kensington.
13	—	9	—	10	—	17	1	13	2	15	1	10	1	148	7	Fulham.
4	1	9	—	4	—	5	—	7	—	6	—	6	1	74	2	Hammersmith.
4	1	8	1	7	—	8	—	3	—	6	1	7	—	97	5	Paddington.
10	—	7	1	9	1	9	—	10	1	13	2	8	1	115	6	Chelsea.
4	—	6	—	5	—	13	—	8	1	6	—	7	—	97	4	St. George, Hanover Sq.*
2	—	3	—	1	—	1	—	2	—	5	—	4	—	39	1	Westminster.
—	—	1	—	—	—	1	—	—	—	—	—	—	—	10	—	St. James, Westminster.
10	—	4	—	13	—	14	1	18	—	9	—	11	—	165	15	St. Marylebone.
2	1	27	—	7	—	11	1	4	1	11	—	6	—	86	4	Hampstead.
24	1	6	—	22	1	30	—	23	—	31	1	24	1	312	9	St. Pancras.
39	—	28	3	29	3	21	—	18	—	24	1	33	1	304	23	Islington.
5	—	1	—	—	—	5	—	1	—	1	—	—	—	36	1	St. Mary, Stoke Newington.
22	1	23	1	24	—	38	1	11	3	25	—	16	—	315	24	Hackney.
2	—	—	—	—	—	1	—	—	—	1	—	2	—	20	—	St. Giles and St. George, Bloomsbury.
1	—	—	—	3	—	—	—	4	—	—	—	—	—	12	—	St. Martin-in-the-Fields.
1	—	1	—	3	—	2	—	3	—	—	—	—	—	17	—	Strand.†
1	—	—	—	2	—	1	—	4	—	—	—	—	—	15	—	Holborn.‡
3	—	4	—	6	—	4	—	3	—	9	—	3	—	54	—	Clerkenwell.
5	—	5	—	5	—	7	1	—	—	8	—	7	—	53	1	St. Luke, Middlesex.
2	—	1	—	—	—	—	—	8	—	1	—	5	—	39	2	London, City of.§
9	2	11	—	12	—	9	3	15	1	12	1	7	—	130	12	Shoreditch.
17	1	15	—	7	—	7	1	4	1	9	1	7	—	121	6	Bethnal Green
6	—	3	—	9	2	9	—	7	—	5	—	5	—	84	5	Whitechapel.‖
5	—	4	—	3	1	11	—	3	—	5	1	4	—	70	4	St. George-in-the-East.
13	1	5	—	9	1	5	—	14	1	6	1	15	3	125	12	Limehouse.
12	1	16	—	12	—	11	3	13	—	6	—	5	—	136	11	Mile End Old Town.
29	—	20	—	22	1	14	—	17	1	16	2	10	3	220	9	Poplar.
3	—	3	1	1	—	5	—	4	—	3	—	—	—	28	3	St. Saviour, Southwark.
3	—	6	—	6	—	9	—	7	1	5	1	2	—	81	5	St. George, Southwark.
3	1	3	—	10	—	9	1	9	1	11	—	9	2	124	8	Newington.
1	—	—	—	1	—	—	—	—	—	—	—	—	—	3	2	St. Olave, Southwark.
8	1	5	1	9	—	6	1	8	—	9	1	8	1	81	7	Bermondsey.
8	—	5	—	4	—	2	—	2	—	3	—	4	—	53	2	Rotherhithe.
24	—	11	4	20	1	25	—	20	1	25	1	13	1	291	23	Lambeth.
15	—	20	—	7	—	17	1	7	1	18	—	13	—	251	9	Battersea.
19	—	15	2	18	1	9	—	8	—	5	—	20	—	210	6	Wandsworth.
19	1	18	2	15	1	16	1	16	2	18	1	29	1	309	12	Camberwell.
24	5	21	2	12	—	20	—	16	—	18	2	20	1	257	20	Greenwich.
7	1	1	—	5	—	4	—	3	—	6	—	5	—	89	5	Lewisham.
7	1	4	1	10	1	14	—	20	1	11	—	7	1	96	7	Woolwich.
7	—	3	1	3	—	2	1	4	—	9	—	9	1	87	7	Plumstead.
1	—	4	—	—	—	5	—	5	—	1	—	2	—	33	3	Lee.
1	—	—	—	1	—	—	—	—	—	—	—	—	—	11	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population 96).

‖ Including Tower of London (population, 866).

	Sanitary Areas.	Population (1891).	SCARLET FEVER—*continued.*											
			Weekly Statement, 3rd Quarter, 1894.											
			July 7.		July 14.		July 21.		July 28.		Aug. 4.		Aug. 11.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]403	17	410	16	394	24	352	29	354	18	327	19
	(*Administrative County*)		[b]*389*	—	*400*	—	*384*	—	*347*	—	*347*	—	*347*	—
W. District.	Kensington	166,308	8	—	11	—	11	—	2	—	8	—	5	—
	Fulham	91,639	7	—	11	—	7	—	12	1	9	1	6	—
	Hammersmith	97,239	4	—	7	—	9	—	7	2	3	—	6	—
	Paddington	117,846	4	1	8	1	2	—	7	1	10	—	11	—
	Chelsea	96,253	5	—	13	1	5	2	8	1	7	—	5	—
	St. George, Hanover Sq.*	78,599	5	1	3	1	3	1	**7	—	2	—	4	—
	Westminster	55,539	1	—	4	—	3	1	—	1	3	—	3	—
	St. James, Westminster	24,995	1	—	3	—	1	—	—	—	2	—	3	—
N. District.	St. Marylebone	142,404	19	—	17	1	16	1	15	—	11	1	8	—
	Hampstead	68,416	5	—	6	1	10	—	6	—	5	—	5	1
	St. Pancras	234,379	25	1	31	1	27	—	31	2	40	—	21	1
	Islington	319,143	23	2	31	—	32	1	33	2	31	2	22	1
	St. Mary, Stoke Newington	30,936	—	—	1	—	3	—	2	—	2	—	2	—
	Hackney	198,606	16	—	24	1	18	1	19	4	22	2	11	2
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	5	—	3	—	—	—	2	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	2	—	—	1	—	—
	Strand†	25,217	2	—	—	—	—	—	1	—	3	—	1	—
	Holborn‡	34,043	1	—	2	—	2	—	1	—	1	—	1	—
	Clerkenwell	66,216	6	1	6	—	2	—	1	1	10	—	3	—
	St. Luke, Middlesex	42,440	2	—	2	—	1	—	1	—	4	1	3	—
	London, City of§	37,583	1	—	1	—	2	—	—	—	2	—	—	—
E. District.	Shoreditch	124,009	16	2	8	—	18	—	7	—	15	1	6	—
	Bethnal Green	129,132	8	—	11	1	8	—	5	—	6	—	6	—
	Whitechapel‖	74,420	2	1	9	1	4	1	6	—	10	—	3	—
	St. George-in-the-East	45,795	8	—	5	—	9	2	5	3	2	1	6	—
	Limehouse	57,376	13	—	14	—	6	1	10	1	6	1	4	—
	Mile End Old Town	107,592	14	—	12	2	12	—	7	1	11	—	13	3
	Poplar	166,748	19	—	22	1	13	5	12	2	14	2	18	2
S. District.	St. Saviour, Southwark	27,177	5	—	4	1	1	—	3	—	2	1	—	—
	St. George, Southwark	59,712	14	—	11	—	6	—	2	—	2	—	9	1
	Newington	115,804	13	—	6	—	12	—	9	—	13	—	13	1
	St. Olave, Southwark	12,723	2	—	2	—	—	—	—	—	—	—	1	—
	Bermondsey	84,682	19	—	6	—	13	—	7	—	3	1	5	—
	Rotherhithe	39,255	5	1	3	—	1	1	6	—	5	—	6	1
	Lambeth	275,203	31	1	25	1	26	1	16	—	22	1	13	—
	Battersea	150,558	21	—	10	—	8	—	21	—	16	1	13	—
	Wandsworth	156,942	13	1	16	—	17	—	7	1	4	—	11	—
	Camberwell	235,344	6	1	10	1	17	3	18	1	16	—	19	3
	Greenwich	165,413	22	3	22	1	29	—	24	3	7	—	24	2
	Lewisham	92,647	4	—	6	—	5	—	3	1	—	—	7	—
	Woolwich	40,848	3	1	10	—	11	3	5	—	4	1	4	1
	Plumstead	72,158	21	—	16	—	18	—	17	—	19	—	18	—
	Lee	16,381	9	—	1	—	1	—	4	1	1	—	5	—
	Port of London	—	—	—	—	—	—	—	—	—	1	—	1	—

[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SCARLET FEVER—*continued.*

Weekly Statement, 3rd Quarter, 1894—*continued.*														Totals for 3rd Quarter, 1894.		Sanitary Areas.
Aug. 18.		Aug. 25.		Sept. 1.		Sept. 8.		Sept. 15.		Sept. 22.		Sept. 29.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
268	14	312	17	326	13	327	13	373	15	397	15	393	18	4,636	228	London.
261	—	*309*	—	*318*	—	*316*	—	*369*	—	*396*	—	*384*	—	*4,580*	—	(*Administrative County.*)
2	—	4	—	11	—	14	—	2	1	5	1	12	—	95	2	Kensington.
5	—	5	—	6	1	9	2	8	—	17	—	16	—	118	5	Fulham.
13	—	12	1	10	—	6	1	6	—	14	—	10	—	106	4	Hammersmith.
2	—	3	1	3	—	5	1	10	—	2	—	2	—	69	5	Paddington.
4	—	6	—	1	—	6	—	1	—	6	1	9	1	76	6	Chelsea.
3	—	3	1	5	—	2	—	7	—	1	—	2	—	47	4	St. George, Hanover Sq.**
3	—	4	—	1	—	5	—	3	—	2	—	2	—	34	2	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	13	—	St. James, Westminster.
5	—	5	—	5	3	5	—	13	1	7	—	7	—	133	7	St. Marylebone.
5	1	9	—	3	—	8	—	2	—	6	—	10	—	80	3	Hampstead.
23	2	26	4	40	2	26	1	37	2	43	3	23	—	398	19	St. Pancras.
25	—	32	—	40	3	24	1	33	2	37	—	33	3	401	17	Islington.
—	—	1	—	7	—	—	—	1	—	2	—	2	—	23	—	S.Mary,Stoke Newington
21	—	24	1	16	—	18	1	27	1	13	1	13	1	242	15	Hackney.
2	—	—	—	2	—	1	—	1	—	—	—	1	—	17	—	St. Giles and St. George, Bloomsbury.
1	—	—	—	1	—	—	—	—	—	—	—	1	—	5	1	St. Martin-in-the-Fields.
—	—	—	—	—	—	1	—	4	—	4	—	—	—	16	—	Strand.†
—	—	2	—	—	—	1	—	2	—	—	—	—	—	13	—	Holborn.‡
4	—	3	1	3	—	2	—	12	—	4	—	3	1	59	4	Clerkenwell.
—	—	2	—	1	—	1	—	2	—	—	1	4	—	23	2	St. Luke, Middlesex.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	8	—	London, City of.§
6	2	10	—	14	—	8	1	10	—	9	—	6	—	133	6	Shoreditch.
11	—	13	1	14	1	13	1	7	—	16	—	18	1	136	5	Bethnal Green.
4	—	5	—	4	—	1	—	4	1	7	—	6	—	65	4	Whitechapel.‖
2	1	6	1	2	—	7	—	2	—	2	—	5	1	61	9	St. George-in-the-East.
6	1	6	—	5	1	4	1	11	1	6	—	9	1	100	8	Limehouse.
5	—	9	1	9	—	12	—	12	—	9	—	11	—	136	7	Mile End Old Town.
13	1	14	—	9	1	11	—	8	1	12	2	20	1	195	18	Poplar.
—	—	—	—	2	—	3	—	1	—	1	—	3	—	25	2	St. Saviour, Southwark.
1	—	2	—	3	—	8	—	10	1	7	—	1	—	76	2	St. George, Southwark.
13	—	9	—	7	—	15	—	9	—	13	—	14	—	146	1	Newington.
1	—	1	—	—	—	1	—	—	—	—	—	—	—	8	—	St. Olave, Southwark.
5	—	6	—	4	—	7	—	13	—	6	—	5	1	99	2	Bermondsey.
2	—	8	—	1	—	2	—	7	2	5	—	14	—	65	5	Rotherhithe.
15	1	19	—	18	—	28	2	24	—	16	—	24	1	277	8	Lambeth.
8	2	14	—	18	—	10	—	9	—	21	—	12	2	181	5	Battersea.
15	—	8	1	9	—	7	—	8	1	13	—	12	—	140	4	Wandsworth.
4	—	6	—	16	—	15	—	10	—	27	3	19	1	183	13	Camberwell.
16	—	11	1	20	—	14	1	40	1	40	1	24	1	293	14	Greenwich.
3	—	6	—	3	—	4	—	1	—	1	—	1	1	44	2	Lewisham.
4	2	2	2	1	—	5	—	2	—	—	—	9	—	60	10	Woolwich.
14	1	12	1	12	1	17	—	2	—	19	2	12	1	197	6	Plumstead.
2	—	2	—	—	—	1	—	2	—	4	—	4	—	36	1	Lee.
1	—	1	—	—	—	—	—	—	—	—	—	1	—	5	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

** St. Peters, Westminster, 2.

	Sanitary Areas.	Population (1891).	Scarlet Fever—*continued.*													
			Weekly Statement, 4th Quarter, 1894.													
			Oct. 6.		Oct. 13.		Oct. 20.		Oct. 27.		Nov. 3.		Nov. 10.		Nov. 17.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - - - -	4,232,118	[a] 397	9	365	12	383	18	362	17	343	10	358	9	335	8
	(*Administrative County*) -	- -	[b] *390*	—	*355*	—	*371*	—	*358*	—	*336*	—	*348*	—	*324*	—
W. District.	Kensington - - -	166,308	9	1	12	2	11	1	4	—	4	—	9	—	3	—
	Fulham - - - -	91,639	8	—	12	—	12	2	6	—	10	1	9	—	4	—
	Hammersmith - -	97,239	9	—	6	—	6	—	7	—	5	—	6	—	6	—
	Paddington - - -	117,846	5	—	7	—	4	—	5	—	4	—	4	—	7	—
	Chelsea - - - -	96,253	4	—	5	—	3	—	5	1	6	1	4	—	9	—
	St. George, Hanover Sq.* -	78,599	1	—	6	—	3	—	—	—	3	—	2	—	5	—
	Westminster - -	55,539	4	—	3	—	2	—	4	—	—	—	—	—	7	—
	St. James, Westminster -	24,995	—	—	—	—	2	—	—	—	—	—	1	—	2	—
N. District.	St. Marylebone - -	142,404	8	—	9	—	11	—	5	1	8	—	10	—	15	—
	Hampstead - - -	68,416	4	—	5	—	7	—	1	—	5	—	6	—	2	—
	St. Pancras - - -	234,379	31	—	25	—	45	2	28	—	28	—	30	2	22	—
	Islington - - -	319,143	42	1	32	1	30	2	43	1	35	—	41	1	27	1
	St. Mary, Stoke Newington	30,936	—	—	1	—	9	—	—	—	2	—	6	1	3	1
	Hackney - - -	198,606	22	1	14	—	14	—	17	2	17	—	15	—	23	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	—	4	—	2	—	—	—	—	—	1	—	2	—
	St. Martin-in-the-Fields -	14,616	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	Strand† - - -	25,217	2	—	1	—	1	—	—	—	1	—	—	—	3	—
	Holborn‡ - - -	34,043	2	—	2	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell - - -	66,216	2	—	7	2	7	—	—	—	3	—	4	1	8	—
	St. Luke, Middlesex -	42,440	2	1	—	1	1	—	4	—	1	—	3	1	2	—
	London, City of§ - -	37,583	2	—	—	—	1	1	1	—	1	—	2	—	1	—
E. District.	Shoreditch - - -	124,009	20	1	9	—	8	—	7	—	9	—	6	—	9	—
	Bethnal Green - -	129,132	16	—	7	—	11	1	10	—	4	—	9	—	12	2
	Whitechapel‖ - -	74,420	7	—	5	—	6	—	10	1	1	—	3	—	7	1
	St. George-in-the-East -	45,795	6	—	—	—	5	—	1	—	5	—	3	—	3	—
	Limehouse - - -	57,376	7	—	11	—	4	—	9	1	7	1	5	—	7	—
	Mile End Old Town -	107,592	23	—	11	—	7	1	8	—	15	2	8	—	5	1
	Poplar - - -	166,748	21	—	12	1	17	1	18	2	21	—	14	—	9	—
S. District.	St. Saviour, Southwark -	27,177	2	—	1	—	4	—	4	—	2	1	1	—	2	—
	St. George, Southwark -	59,712	2	—	6	—	6	—	6	1	5	—	14	—	1	—
	Newington - - -	115,804	15	—	16	1	11	—	18	—	16	1	10	1	13	—
	St. Olave, Southwark -	12,723	—	—	—	—	1	—	—	—	1	—	1	—	—	—
	Bermondsey - - -	84,682	6	1	13	—	10	—	13	—	15	—	17	—	5	—
	Rotherhithe - - -	39,255	4	—	14	—	17	—	16	1	8	—	10	1	19	—
	Lambeth - - -	275,203	28	1	29	—	41	2	20	2	26	1	24	—	16	1
	Battersea - - -	150,558	14	—	13	—	17	1	10	—	4	—	11	—	16	—
	Wandsworth - -	156,942	6	1	9	—	10	1	15	—	12	—	11	—	19	—
	Camberwell - - -	235,344	18	—	19	1	11	1	14	1	22	1	19	1	16	—
	Greenwich - - -	165,413	23	1	19	1	10	1	24	—	17	—	14	—	12	—
	Lewisham - - -	92,647	6	—	3	—	4	1	10	—	6	—	15	—	1	—
	Woolwich - - -	40,848	3	—	2	1	4	—	2	—	—	—	1	—	2	—
	Plumstead - - -	72,158	5	—	13	1	6	—	9	2	9	1	14	—	9	—
	Lee - - - -	16,881	6	—	2	—	2	—	8	1	5	—	5	—	1	1
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SCARLET FEVER—*continued.*

Weekly Statement, 4th Quarter, 1894—*continued.*												Totals for 4th Quarter, 1894.		Grand Totals for Year 1894.		Sanitary Areas.
Nov. 24.		Dec. 1.		Dec. 8.		Dec. 15.		Dec. 22.		Dec. 29.						
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
341	14	283	19	382	18	272	13	268	14	190	14	4,238	175	18,909	961	London.
334	—	*280*	—	*377*	—	*257*	—	*263*	—	*194*	—	*4,142*	—	*18,493*	—	(*Administrative County.*)
3	2	1	—	4	1	10	—	5	—	6	—	81	7	401	22	Kensington.
22	3	14	2	18	2	15	1	12	2	8	—	150	13	547	33	Fulham.
7	—	5	—	7	1	3	—	3	—	2	1	72	2	337	14	Hammersmith.
7	—	3	—	2	—	1	—	3	—	1	—	53	—	302	14	Paddington.
3	1	6	—	5	—	4	—	3	—	4	—	61	3	327	16	Chelsea.
9	—	1	1	3	—	2	—	3	—	—	1	38	2	274	11	St. George, Hanover Sq.*
—	—	—	—	3	—	2	—	5	1	6	—	36	1	148	7	Westminster.
2	—	2	1	4	—	3	—	2	—	3	—	21	1	63	3	St. James, Westminster.
5	—	13	—	5	1	10	—	6	1	5	1	110	4	582	40	St. Marylebone.
1	—	2	—	7	—	5	2	4	—	1	—	50	2	268	10	Hampstead.
21	1	33	1	19	1	24	1	28	1	8	1	342	10	1,304	51	St. Pancras.
26	—	25	2	41	2	24	1	26	—	11	1	403	13	1,567	69	Islington.
—	—	—	—	1	—	—	—	—	1	—	—	22	3	81	6	S. Mary, Stoke Newington.
13	—	8	2	15	—	14	—	10	1	6	1	188	7	1,090	57	Hackney.
2	—	6	—	—	—	—	—	1	—	1	—	20	—	90	2	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	1	—	2	—	21	1	St. Martin-in-the-Fields.
1	—	1	—	1	—	**2	—	1	—	—	—	14	—	63	1	Strand.†
—	—	2	—	—	—	4	—	3	—	1	—	14	—	86	—	Holborn.‡
1	—	4	—	2	—	4	—	—	—	3	—	45	3	229	10	Clerkenwell.
—	—	—	—	2	—	1	—	—	—	7	—	23	3	127	10	St. Luke, Middlesex.
—	—	1	—	2	—	—	—	—	—	—	—	11	1	92	9	London, City of.§
9	—	6	—	11	—	9	—	8	—	9	—	120	1	404	28	Shoreditch.
9	—	6	1	5	—	11	1	10	1	8	—	118	6	525	27	Bethnal Green.
5	—	5	—	7	1	3	1	2	1	2	—	63	5	280	23	Whitechapel.‖
4	—	3	1	5	—	1	—	3	—	5	—	44	1	231	18	St. George-in-the-East.
12	—	4	—	6	2	2	—	4	—	—	—	78	4	379	33	Limehouse.
10	—	10	—	10	—	10	1	7	—	8	—	132	5	590	37	Mile End Old Town.
19	1	7	—	26	1	13	—	17	1	14	—	208	7	814	40	Poplar.
—	—	2	—	—	—	—	—	4	—	—	—	22	1	104	6	St. Saviour, Southwark.
3	1	3	—	8	—	6	1	2	—	5	—	67	3	300	17	St. George, Southwark.
15	—	7	—	10	—	3	—	3	1	5	—	142	4	563	19	Newington.
1	—	3	—	1	—	—	—	1	—	1	—	10	—	34	4	St. Olave, Southwark
19	1	10	2	9	2	5	—	6	1	6	2	134	9	398	23	Bermondsey.
10	—	12	2	9	—	7	—	5	—	6	1	137	5	337	15	Rotherhithe.
25	1	8	2	15	2	14	3	17	—	7	1	270	16	1,186	64	Lambeth.
19	1	22	—	14	1	12	—	17	1	13	2	182	6	851	32	Battersea.
14	—	10	1	5	1	11	—	8	—	10	—	140	4	691	20	Wandsworth.
12	—	15	—	9	—	7	—	12	—	7	—	161	5	947	46	Camberwell.
16	2	12	—	26	—	14	1	14	—	16	2	217	8	1,070	59	Greenwich.
2	—	1	—	1	—	2	—	2	—	—	—	53	1	269	12	Lewisham.
2	—	2	1	1	—	3	—	4	—	—	—	26	2	222	22	Woolwich.
2	—	6	—	12	—	11	—	6	1	1	—	103	5	533	23	Plumstead.
—	—	2	—	1	—	—	—	1	—	2	—	35	2	133	7	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 808). ** Middle Temple, 2

	Sanitary Areas.	Population (1891).	Diphtheria.											
			Weekly Statement, 1st Quarter, 1894.											
			Jan. 6.		Jan. 13.		Jan. 20.		Jan. 27.		Feb. 3.		Feb. 10.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]255	66	184	54	215	46	235	51	208	70	218	53
	(*Administrative County*)	-	[b]249	—	182	—	212	—	209	—	200	—	214	—
W. District.	Kensington	166,308	5	2	7	—	4	1	4	3	4	—	6	2
	Fulham	91,639	7	3	2	4	3	2	4	1	7	4	9	4
	Hammersmith	97,239	3	3	2	2	3	1	4	1	2	1	3	1
	Paddington	117,846	6	4	3	1	11	—	7	1	11	3	5	4
	Chelsea	96,253	1	—	4	—	4	—	6	—	1	1	3	1
	St. George, Hanover Sq.*	78,599	5	—	—	2	2	—	3	—	1	—	1	—
	Westminster	55,539	1	—	—	—	2	—	4	—	2	1	—	—
	St. James, Westminster	24,995	1	—	1	—	—	2	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	7	1	6	3	5	2	8	—	4	1	6	2
	Hampstead	68,416	1	—	4	—	1	1	4	1	2	1	—	—
	St. Pancras	234,379	16	3	14	3	13	1	14	3	15	3	16	6
	Islington	319,143	30	3	12	3	32	6	34	10	17	13	18	2
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	1	—	—	—	—
	Hackney	198,606	15	5	19	3	17	—	18	3	8	5	12	3
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	—	1	1	—	1	—	—	—	—	3	—
	St. Martin-in-the-Fields	14,616	—	—	1	1	1	—	—	—	—	—	—	—
	Strand†	25,217	1	—	—	—	1	1	—	—	1	—	4	1
	Holborn‡	34,043	4	—	2	1	5	2	4	—	2	1	4	—
	Clerkenwell	66,216	6	1	5	—	2	1	3	1	3	—	2	—
	St. Luke, Middlesex	42,440	2	2	2	1	—	—	—	—	1	1	2	1
	London, City of§	37,583	—	—	1	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	7	2	5	—	5	—	10	2	10	3	6	3
	Bethnal Green	129,132	10	2	5	3	5	1	13	5	9	2	14	1
	Whitechapel‖	74,420	5	1	1	1	2	1	3	1	3	1	1	—
	St. George-in-the-East	45,795	4	2	5	5	7	—	2	1	4	—	5	1
	Limehouse	57,376	1	—	2	—	2	1	5	—	3	2	—	1
	Mile End Old Town	107,592	14	—	4	1	3	2	5	1	7	4	10	2
	Poplar	166,748	15	6	7	3	16	2	6	1	6	2	10	1
S. District.	St. Saviour, Southwark	27,177	3	—	—	—	1	—	—	—	—	—	1	—
	St. George, Southwark	59,712	1	2	1	1	—	—	—	—	6	—	1	—
	Newington	115,804	3	—	4	3	8	2	3	3	9	1	15	2
	St. Olave, Southwark	12,723	—	—	—	—	—	—	2	1	2	—	—	—
	Bermondsey	84,682	3	—	5	1	5	4	2	—	7	1	3	1
	Rotherhithe	39,255	6	—	2	—	1	—	4	—	5	1	—	—
	Lambeth	275,203	24	5	8	1	8	3	9	—	10	5	13	3
	Battersea	150,558	13	4	12	1	16	3	16	3	14	3	5	1
	Wandsworth	156,942	7	5	6	1	6	2	4	1	2	3	14	2
	Camberwell	235,344	14	4	12	1	10	2	11	1	11	2	9	—
	Greenwich	165,413	6	3	11	4	6	3	10	1	11	4	14	4
	Lewisham	92,647	—	—	3	—	3	—	2	2	3	—	2	3
	Woolwich	40,848	1	—	—	—	1	—	—	—	1	—	—	—
	Plumstead	72,158	6	2	5	1	4	2	6	—	2	—	1	1
	Lee	16,381	—	1	—	2	—	—	—	3	—	1	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

DIPHTHERIA—*continued.*

Weekly Statement, 1st Quarter, 1894—*continued.*														Totals for 1st Quarter, 1894.		Sanitary Areas.
Feb. 17.		Feb. 24.		March 3.		March 10.		March 17.		March 24.		March 31.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
199	56	186	42	212	59	185	51	209	52	201	54	192	56	2,687	712	London.
191	—	*180*	—	*203*	—	*178*	—	*198*	—	*187*	—	*187*	—	*2,535*	—	(*Administrative County.*)
5	1	1	—	5	2	3	1	8	2	6	3	7	2	65	19	Kensington.
3	1	3	2	9	3	6	3	7	3	3	1	2	2	65	33	Fulham.
3	1	3	—	2	—	1	1	3	—	2	1	4	—	35	12	Hammersmith.
6	2	5	1	4	1	5	1	10	1	6	—	1	1	80	20	Paddington.
1	1	3	1	—	1	2	—	6	—	15	4	9	—	55	9	Chelsea.
2	—	2	—	—	—	3	1	2	—	1	1	1	2	23	6	St. George, Hanover Sq.*
—	—	2	—	2	—	2	1	3	1	1	3	—	1	19	7	Westminster.
3	1	—	—	2	1	—	—	1	1	3	1	—	1	11	7	St. James, Westminster.
7	1	10	2	6	1	4	2	6	2	2	2	9	1	75	20	St. Marylebone.
—	—	1	—	1	—	3	—	—	1	2	—	5	3	24	7	Hampstead.
10	5	10	1	10	1	8	1	10	2	7	—	6	5	149	34	St. Pancras.
18	3	24	8	12	4	12	4	22	5	14	3	15	5	260	68	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	St. Mary, Stoke Newington.
18	—	5	1	16	4	15	4	12	1	14	4	15	4	184	37	Hackney.
5	—	1	—	1	—	2	—	—	1	4	—	2	2	20	5	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	1	1	—	—	3	2	St. Martin-in-the-Fields.
—	—	2	1	—	—	1	—	—	—	1	1	—	—	11	4	Strand.†
2	1	1	—	4	1	6	—	—	1	1	1	—	—	35	8	Holborn.‡
3	—	5	3	6	1	—	1	7	—	3	1	4	2	49	11	Clerkenwell.
—	—	—	—	1	—	3	—	2	—	1	—	1	1	15	6	St. Luke, Middlesex.
1	—	—	—	—	—	1	—	—	—	—	—	—	—	3	—	London, City of.§
7	3	1	—	13	4	2	1	7	1	16	2	3	5	92	26	Shoreditch.
16	7	11	5	18	8	11	6	3	6	4	1	9	1	128	48	Bethnal Green.
2	—	3	1	3	—	3	—	1	1	2	—	4	—	33	7	Whitechapel.‖
2	—	5	—	8	2	2	—	—	—	—	—	8	2	52	13	St. George-in-the-East.
5	2	1	1	6	2	1	1	4	1	—	—	—	—	30	11	Limehouse.
9	3	8	2	6	—	9	4	3	1	7	1	7	1	92	22	Mile End Old Town.
10	5	12	3	10	1	10	2	12	4	13	4	22	2	149	36	Poplar.
2	—	1	—	1	1	1	—	1	—	—	—	—	1	11	2	St. Saviour, Southwark.
2	—	8	1	4	2	2	—	—	—	2	—	—	1	27	7	St. George, Southwark.
6	1	6	1	6	3	9	—	7	—	2	1	18	—	91	17	Newington.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	5	1	St. Olave, Southwark.
3	—	1	—	2	—	1	1	1	—	—	—	2	—	35	8	Bermondsey.
—	—	—	—	2	—	—	—	11	1	4	—	1	—	36	2	Rotherhithe.
10	3	15	2	6	2	6	4	11	5	12	2	5	—	137	35	Lambeth.
9	2	12	3	6	5	7	1	7	2	16	2	5	1	138	31	Battersea.
9	5	3	1	8	1	10	5	9	1	3	2	3	—	84	29	Wandsworth.
7	3	4	—	15	3	12	2	15	2	8	5	14	4	142	29	Camberwell.
9	3	12	1	15	4	10	2	9	4	20	4	9	5	142	42	Greenwich.
1	1	1	1	2	—	7	1	6	—	2	1	4	1	36	10	Lewisham.
—	—	—	—	—	—	1	1	1	—	1	—	—	—	6	1	Woolwich.
3	1	3	—	—	—	4	—	2	1	2	—	1	—	39	8	Plumstead.
—	—	—	—	—	1	—	—	—	1	—	2	1	—	1	11	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	DIPHTHERIA—*continued.*											
			Weekly Statement, 2nd Quarter, 1894.											
			April 7.		April 14.		April 21.		April 28.		May 5.		May 12.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - - - -	4,232,118	[a]190	61	227	48	247	53	240	62	237	58	210	54
	(*Administrative County*) -	- -	[b]*191*	—	*218*	—	*235*	—	*225*	—	*227*	—	*197*	—
W. District.	Kensington - - - -	166,308	5	1	1	1	7	2	7	3	7	1	2	2
	Fulham - - - -	91,639	6	2	6	—	7	1	3	3	4	—	4	4
	Hammersmith - -	97,239	4	1	—	1	5	—	5	1	3	1	4	1
	Paddington - - -	117,846	3	2	16	2	13	2	4	4	7	2	5	2
	Chelsea - - -	96,253	5	2	2	1	2	2	6	1	6	1	2	—
	St. George, Hanover Sq.* -	78,599	2	—	—	2	3	—	1	—	3	—	4	—
	Westminster - -	55,539	1	—	1	—	1	—	2	2	—	—	—	—
	St. James, Westminster -	24,995	—	1	—	—	4	1	2	—	1	—	—	—
N. District.	St. Marylebone - -	142,404	8	3	6	2	4	2	5	1	12	4	8	2
	Hampstead - - -	68,416	2	1	2	—	2	—	3	1	—	1	2	1
	St. Pancras - - -	234,379	7	2	8	3	17	1	18	5	12	—	6	3
	Islington - - -	319,143	21	4	16	5	15	5	15	5	26	7	22	3
	St. Mary, Stoke Newington	30,936	—	—	1	—	—	—	1	—	1	1	3	—
	Hackney - - -	198,606	7	1	11	1	17	3	10	2	7	5	13	2
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	2	1	1	—	—	1	—	—	—	—	—
	St. Martin-in-the-Fields -	14,616	—	—	—	—	—	—	—	—	—	—	1	—
	Strand† - - -	25,217	1	1	—	—	1	—	—	—	—	—	1	—
	Holborn‡ - - -	34,043	1	—	1	—	1	1	—	1	—	—	1	—
	Clerkenwell - - -	66,216	2	1	2	—	2	—	1	—	—	—	6	1
	St. Luke, Middlesex -	42,440	2	—	3	—	3	—	2	—	3	1	1	—
	London, City of § - -	37,583	—	—	1	—	—	—	1	—	1	—	1	1
E. District.	Shoreditch - - -	124,009	7	1	6	2	8	2	6	5	4	1	10	2
	Bethnal Green - -	129,132	9	1	15	2	17	2	16	2	12	2	7	5
	Whitechapel‖ - -	74,420	2	—	6	3	1	—	2	—	6	—	2	—
	St. George-in-the-East -	45,795	1	1	8	—	4	2	5	—	7	—	5	—
	Limehouse - - -	57,376	3	1	8	1	4	2	5	—	4	1	2	—
	Mile End Old Town -	107,592	8	4	8	—	12	—	8	2	14	2	8	4
	Poplar - - -	166,748	16	5	29	3	19	5	20	2	13	5	13	2
S. District.	St. Saviour, Southwark -	27,177	1	—	1	—	1	1	1	—	3	2	2	—
	St. George, Southwark -	59,712	—	—	3	1	8	3	2	1	4	3	5	—
	Newington - - -	115,804	6	2	10	3	10	—	12	1	9	—	5	—
	St. Olave, Southwark -	12,723	—	—	1	—	—	—	—	—	—	—	—	—
	Bermondsey - - -	84,682	10	3	8	1	13	5	5	4	7	1	5	1
	Rotherhithe - - -	39,255	1	—	2	—	5	1	6	1	2	3	4	3
	Lambeth - - -	275,203	10	5	8	4	10	3	11	2	12	1	11	4
	Battersea - - -	150,558	6	3	7	3	12	1	13	1	13	2	12	4
	Wandsworth - -	156,942	4	1	5	1	4	1	4	1	8	4	7	2
	Camberwell - - -	235,344	19	5	7	4	6	2	17	8	9	3	12	2
	Greenwich - - -	165,413	14	3	11	—	5	1	12	5	8	1	11	—
	Lewisham - - -	92,647	2	1	4	1	3	2	3	1	4	—	1	1
	Woolwich - - -	40,848	—	—	—	—	—	—	1	—	—	—	—	—
	Plumstead - - -	72,158	2	1	1	—	1	—	1	—	5	2	2	2
	Lee - - - -	16,381	—	—	1	—	—	—	3	2	—	1	—	—
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

DIPHTHERIA—*continued.*

Weekly Statement, 2nd Quarter, 1894—*continued.*														Totals for 2nd Quarter, 1894.		Sanitary Areas.
May 19.		May 26.		June 2.		June 9.		June 16.		June 23.		June 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
221	55	208	41	196	35	197	34	220	43	224	44	202	56	2,828	644	London.
206	—	*202*	—	*189*	—	*182*	—	*212*	—	*211*	—	*190*	—	*2,691*	—	(*Administrative County.*)
4	2	4	1	3	—	7	—	5	2	1	1	5	—	58	16	Kensington.
4	2	6	2	5	1	4	—	13	5	10	2	10	3	82	25	Fulham.
2	—	3	2	4	1	1	1	2	—	5	—	2	3	40	12	Hammersmith.
9	2	8	3	13	1	4	1	4	4	8	3	9	2	103	30	Paddington.
5	1	3	3	4	2	11	—	6	2	3	—	5	1	60	16	Chelsea.
1	—	5	1	5	1	3	—	4	—	2	—	—	—	33	4	St. George, Hanover Sq.*
—	—	—	—	—	1	—	—	—	—	—	—	1	—	6	3	Westminster.
1	—	2	1	—	—	—	—	—	—	—	—	1	—	11	3	St. James, Westminster.
9	5	5	1	3	2	3	—	5	1	7	3	9	4	84	30	St. Marylebone.
1	—	3	—	3	1	—	—	1	1	2	—	—	—	21	6	Hampstead.
6	3	10	1	6	1	6	1	12	2	14	1	6	1	128	24	St. Pancras.
26	8	20	3	24	3	15	5	17	3	24	7	4	4	245	62	Islington.
2	—	2	—	1	—	2	—	—	—	1	—	1	—	15	1	St. Mary, Stoke Newington.
10	5	3	—	8	1	8	3	7	1	7	2	8	1	116	27	Hackney.
—	—	—	—	—	—	—	—	2	1	2	—	—	—	7	4	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Martin-in-the-Fields.
—	—	1	1	—	—	1	—	—	—	—	—	1	—	6	1	Strand.†
2	—	2	1	2	—	3	1	—	—	4	1	—	—	17	5	Holborn.‡
3	1	3	—	2	—	4	2	5	1	—	1	2	1	32	8	Clerkenwell.
1	—	1	—	1	1	1	—	1	—	—	—	1	—	20	2	St. Luke, Middlesex.
—	—	—	—	2	—	—	—	2	—	2	—	1	—	11	1	London, City of.§
6	—	2	2	2	1	5	—	4	2	1	—	8	3	69	21	Shoreditch.
1	4	13	2	12	2	13	2	18	3	12	5	15	1	160	33	Bethnal Green.
5	2	4	—	2	1	2	1	1	—	2	1	4	3	39	11	Whitechapel.‖
4	2	6	2	8	—	4	1	8	2	9	2	1	3	70	15	St. George-in-the-East.
3	2	3	1	1	—	5	1	6	1	3	1	3	—	50	11	Limehouse.
13	2	7	2	3	—	4	1	5	1	8	1	7	1	105	20	Mile End Old Town.
27	1	17	2	6	—	11	1	9	—	19	—	5	1	204	27	Poplar.
3	1	1	—	2	1	2	—	—	—	—	—	1	1	18	6	St. Saviour, Southwark.
2	1	—	1	4	1	10	2	5	1	8	—	5	2	56	16	St. George, Southwark.
9	—	1	—	1	—	9	2	2	1	6	1	4	1	84	11	Newington.
—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	—	St. Olave, Southwark.
3	—	6	1	9	4	9	3	2	1	8	—	18	4	103	28	Bermondsey.
1	1	1	—	3	1	2	—	6	—	1	1	3	3	37	14	Rotherhithe.
24	1	20	—	21	2	9	—	15	—	10	2	6	1	167	25	Lambeth.
9	2	17	4	6	2	11	1	13	2	9	—	13	2	141	27	Battersea.
3	1	9	—	12	2	5	2	4	—	3	2	8	—	76	17	Wandsworth.
8	2	7	3	5	1	9	1	16	3	14	2	18	8	147	39	Camberwell.
9	3	8	1	9	1	5	—	13	1	10	3	9	—	124	19	Greenwich.
1	—	2	—	2	—	3	2	2	—	1	—	7	1	35	9	Lewisham.
—	—	—	—	—	—	—	—	1	—	4	1	—	1	6	2	Woolwich.
3	1	2	1	1	—	2	—	3	—	3	1	1	—	27	8	Plumstead.
1	—	—	—	1	—	3	—	1	2	1	—	—	—	11	5	Lee.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	DIPHTHERIA—*continued.* Weekly Statement, 3rd Quarter, 1894. July 7. Cases.	July 7. Deaths.	July 14. Cases.	July 14. Deaths.	July 21. Cases.	July 21. Deaths.	July 28. Cases.	July 28. Deaths.	Aug. 4. Cases.	Aug. 4. Deaths.	Aug. 11. Cases.	Aug. 11. Deaths.
	London	4,232,118	[a]240	43	190	43	199	36	207	52	225	55	226	62
	(*Administrative County*)	—	[b]*234*	—	*180*	—	*194*	—	*200*	—	*221*	—	*218*	—
W. District.	Kensington	166,206	3	—	5	—	5	—	11	3	3	2	3	3
	Fulham	91,639	9	1	4	2	4	—	—	2	4	—	3	2
	Hammersmith	97,239	5	—	10	1	3	2	7	1	4	1	4	1
	Paddington	117,846	12	3	12	2	9	2	7	1	11	3	9	2
	Chelsea	96,253	6	1	—	1	5	—	7	—	5	—	5	1
	St George, Hanover Sq.*	78,599	2	—	5	—	3	—	2	1	1	—	6	—
	Westminster	55,539	4	—	—	—	—	—	—	—	1	—	3	1
	St. James, Westminster	24,995	3	—	—	1	—	—	—	—	—	—	1	—
N. District.	St. Marylebone	142,404	11	—	8	2	9	1	—	2	3	—	4	—
	Hampstead	68,416	1	—	2	1	6	—	7	1	2	2	5	—
	St. Pancras	234,379	11	1	7	3	12	1	16	5	5	4	10	4
	Islington	319,143	19	2	8	4	24	4	24	4	18	6	13	4
	St. Mary, Stoke Newington	30,936	—	—	1	—	—	—	1	—	—	—	—	—
	Hackney	198,606	9	3	5	—	6	2	10	—	19	3	9	4
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	—	—	1	1	—	1	—	2	—	—	1
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	1	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	1	—	—	—
	Holborn‡	34,043	2	—	—	1	2	—	1	—	—	—	—	—
	Clerkenwell	66,216	1	—	4	1	2	1	5	—	6	1	2	1
	St. Luke, Middlesex	42,440	2	1	2	—	1	1	1	—	3	—	2	—
	London, City of§	37,583	1	—	1	—	1	—	1	2	1	—	3	—
E. District.	Shoreditch	124,009	5	1	8	2	1	—	6	1	6	1	6	2
	Bethnal Green	129,132	12	2	13	2	8	4	7	4	7	1	6	3
	Whitechapel‖	74,420	4	1	5	—	4	—	9	2	7	—	2	1
	St. George-in-the-East	45,795	4	—	3	—	2	—	5	1	6	2	5	1
	Limehouse	57,376	4	1	3	—	3	—	3	1	3	1	3	1
	Mile End Old Town	107,592	6	1	4	3	2	1	2	—	4	1	5	3
	Poplar	166,748	9	2	15	—	16	4	11	1	14	3	19	2
S. District.	St. Saviour, Southwark	27,177	6	1	—	—	2	—	7	1	4	1	4	1
	St. George, Southwark	59,712	7	2	3	—	3	—	4	3	1	—	2	—
	Newington	115,804	7	3	8	1	8	2	2	—	5	2	6	—
	St. Olave, Southwark	12,723	1	—	1	—	1	—	1	1	1	1	1	—
	Bermondsey	84,682	10	1	9	2	7	1	8	1	6	3	17	5
	Rotherhithe	39,255	1	—	2	—	1	—	3	2	4	1	4	—
	Lambeth	275,203	18	1	10	2	12	1	8	3	14	4	14	2
	Battersea	150,558	6	2	6	4	6	2	8	1	8	1	4	2
	Wandsworth	156,942	7	2	4	1	4	1	7	—	15	2	5	4
	Camberwell	235,344	16	6	12	3	15	4	13	3	15	7	20	5
	Greenwich	165,413	6	4	5	1	8	2	6	4	12	2	12	4
	Lewisham	92,647	4	1	7	1	1	—	1	1	1	—	7	1
	Woolwich	40,848	—	—	1	—	2	—	—	—	2	—	1	—
	Plumstead	72,158	2	—	2	1	—	—	—	—	1	—	1	1
	Lee	16,381	1	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual notifications.

[b] Totals furnished by the Metropolitan Asylums Board of actual cases after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

DIPHTHERIA—*continued.*

Weekly Statement, 3rd Quarter, 1894—*continued.*														Totals for 3rd Quarter, 1894.		Sanitary Areas.
Aug. 18.		Aug. 25.		Sept. 1.		Sept. 8.		Sept. 15.		Sept. 22.		Sept. 29.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
166	57	176	44	161	33	186	38	235	54	244	52	260	67	2,715	636	London.
151	—	*172*	—	*158*	—	*177*	—	*233*	—	*238*	—	*243*	—	*2,598*	—	(*Administrative County.*)
1	1	3	—	—	—	3	1	1	1	13	1	4	3	57	15	Kensington.
5	1	2	1	5	2	3	1	8	1	12	2	7	4	66	19	Fulham.
2	1	1	—	2	1	—	—	2	—	3	1	3	1	46	10	Hammersmith.
3	6	3	1	9	1	5	1	4	1	13	—	6	2	103	25	Paddington.
2	1	8	—	1	—	—	—	5	2	8	1	10	4	62	11	Chelsea.
3	1	—	—	—	—	—	—	1	—	—	—	3	—	26	2	St. George, Hanover Sq.*
3	—	3	3	2	—	3	1	3	1	3	1	6	—	31	7	Westminster.
—	1	—	1	—	—	1	—	—	—	1	—	—	—	6	2	St. James, Westminster.
2	—	3	4	2	—	3	—	2	—	3	—	9	2	59	11	St. Marylebone.
1	1	—	—	1	1	—	—	3	—	2	—	—	—	30	6	Hampstead.
7	1	17	4	7	2	7	2	11	1	22	1	11	5	143	34	St. Pancras.
9	2	8	3	13	3	13	3	25	6	18	5	30	4	222	50	Islington.
—	—	—	—	4	1	—	—	5	—	—	—	—	—	11	1	St. Mary, Stoke Newington.
8	2	8	1	9	—	15	3	10	3	5	1	10	3	123	25	Hackney.
—	—	—	—	—	—	—	—	2	1	1	—	—	—	8	3	St. Giles and St. George, Bloomsbury.
—	1	1	—	1	—	—	—	—	—	—	—	1	—	3	2	St. Martin-in-the-Fields.
1	—	—	—	—	—	1	—	—	1	—	—	—	—	3	1	Strand.†
—	1	1	—	—	—	—	—	—	—	3	—	—	1	9	3	Holborn.‡
7	—	1	—	7	—	5	2	5	1	2	—	6	1	53	8	Clerkenwell.
1	—	2	—	2	2	2	—	—	—	1	—	1	—	20	4	St. Luke, Middlesex.
—	2	3	—	2	—	1	1	5	—	3	—	—	—	22	5	London, City of.§
—	1	3	1	3	2	10	1	4	1	4	—	6	3	62	16	Shoreditch.
10	2	9	1	18	—	10	1	9	2	7	5	14	3	125	30	Bethnal Green.
7	1	9	5	1	—	3	—	4	1	10	1	2	1	67	13	Whitechapel.‖
7	2	3	—	8	2	4	1	2	2	3	—	4	2	56	13	St. George-in-the-East.
1	2	2	—	6	—	3	2	4	1	9	—	3	—	47	9	Limehouse.
5	—	4	1	2	1	4	2	12	—	10	5	7	3	67	21	Mile End Old Town.
7	3	4	—	8	—	10	2	11	2	16	5	8	1	148	25	Poplar.
1	1	—	—	2	—	1	—	—	—	3	1	2	—	32	6	St. Saviour, Southwark.
8	3	3	1	3	—	4	—	7	2	4	1	4	1	53	13	St. George, Southwark.
7	2	7	2	4	—	3	—	5	2	1	—	9	2	67	16	Newington.
—	—	2	—	1	—	—	—	—	—	1	—	1	—	11	2	St. Olave, Southwark.
7	2	4	1	2	—	9	—	4	1	4	—	13	1	100	18	Bermondsey.
4	—	3	1	4	—	7	2	6	1	3	2	5	—	47	9	Rotherhithe.
8	4	16	7	10	2	10	2	17	3	11	4	10	4	158	39	Lambeth.
4	2	6	1	4	4	7	2	12	5	7	1	10	2	83	29	Battersea.
4	—	3	—	7	3	4	—	6	1	2	1	10	4	78	19	Wandsworth.
13	4	18	3	7	2	18	4	21	5	12	4	23	6	198	56	Camberwell.
10	4	12	1	4	2	12	2	15	4	19	6	11	2	133	38	Greenwich.
7	2	4	—	—	1	2	—	2	—	3	2	8	1	47	10	Lewisham.
—	—	1	—	—	—	2	1	2	1	1	1	—	—	12	3	Woolwich.
—	—	3	1	1	—	—	1	—	1	—	—	2	1	12	6	Plumstead.
1	—	1	—	4	1	—	—	—	—	1	—	1	—	9	1	Lee.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Chart[illegible] Inn (population, 21), and Furnival's Inn (population, 122).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population [illegible]

	Sanitary Areas.	Population (1891).	DIPHTHERIA—*continued.*													
			Weekly Statement, 4th Quarter, 1894.													
			Oct. 6.		Oct. 13.		Oct. 20.		Oct. 27.		Nov. 3.		Nov. 10.		Nov. 17.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - - - -	4,232,118	[a]249	66	253	54	252	61	230	49	240	53	239	41	225	44
	(*Administrative County*) -	- -	[b]*235*	—	*236*	—	*240*	—	*216*	—	*231*	—	*232*	—	*218*	—
W. District.	Kensington - - -	166,208	4	3	14	2	11	5	16	3	5	4	6	1	7	—
	Fulham - - -	91,639	8	3	5	1	16	3	6	3	10	2	5	2	4	1
	Hammersmith - -	97,239	4	1	4	2	3	4	5	1	7	1	2	1	9	1
	Paddington - - -	117,846	9	1	9	2	13	—	12	1	14	4	8	3	1	—
	Chelsea - - -	96,253	7	4	7	2	4	1	2	1	4	1	4	—	8	1
	St. George, Hanover Sq.* -	78,599	9	2	5	—	1	1	4	1	8	1	1	1	2	—
	Westminster - -	55,539	3	2	4	—	1	—	1	—	3	2	2	—	3	—
	St. James, Westminster -	24,995	—	—	2	1	2	—	—	—	2	1	1	—	—	—
N. District.	St. Marylebone - -	142,404	4	1	2	—	3	—	7	—	7	1	2	—	10	3
	Hampstead - - -	68,416	1	—	3	—	5	—	1	—	1	—	3	—	3	—
	St. Pancras - - -	234,379	19	3	12	4	13	3	5	2	8	1	13	1	10	2
	Islington - - -	319,143	10	6	20	3	15	4	10	4	16	2	5	2	15	4
	St. Mary, Stoke Newington	30,936	2	—	3	—	1	2	—	—	2	—	2	—	1	—
	Hackney - - -	198,606	11	2	8	3	12	—	21	4	7	3	11	5	11	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	1	—	2	—	2	—	2	1	—	—	3	—	1	—
	St. Martin-in-the-Fields -	14,616	1	—	—	—	2	1	1	—	—	1	1	—	—	—
	Strand† - - -	25,217	—	—	—	—	—	—	—	—	—	—	1	1	—	—
	Holborn‡ - - -	34,043	—	—	1	1	4	—	1	—	—	1	2	—	—	1
	Clerkenwell - - -	66,216	3	2	4	—	2	1	7	—	3	—	7	—	4	1
	St. Luke, Middlesex -	42,440	—	—	1	—	—	—	—	—	2	2	1	—	1	—
	London, City of§ - -	37,583	2	—	1	—	1	—	1	—	2	—	—	—	—	—
E. District.	Shoreditch - - -	124,009	7	1	2	2	5	1	6	—	6	1	6	2	6	—
	Bethnal Green - -	129,132	5	2	6	—	3	1	15	3	11	1	18	2	14	4
	Whitechapel‖ - -	74.420	8	3	3	3	1	1	2	1	2	1	3	—	1	—
	St. George-in-the-East -	45,795	5	2	4	1	3	—	—	—	1	—	1	—	4	1
	Limehouse - - -	57,376	6	4	8	—	4	3	6	2	2	—	4	—	4	—
	Mile End Old Town -	107,592	5	1	15	3	12	3	7	1	7	—	7	1	5	—
	Poplar - - -	166,748	16	1	9	2	13	1	10	3	17	3	11	1	15	2
S. District.	St. Saviour, Southwark -	27,177	5	2	4	—	2	—	2	—	2	1	—	—	—	—
	St. George, Southwark -	59,712	5	2	8	1	4	1	1	1	5	3	7	—	3	1
	Newington - - -	115,804	8	2	4	2	4	3	5	2	4	—	4	—	6	—
	St. Olave, Southwark -	12,723	—	—	1	—	1	—	2	—	1	—	1	—	—	—
	Bermondsey - - -	84,682	1	—	1	2	3	—	3	—	1	2	8	1	—	1
	Rotherhithe - - -	39,255	2	—	—	—	7	—	6	—	1	2	1	1	7	—
	Lambeth - - -	275,203	10	2	14	4	16	2	8	2	13	3	20	3	19	5
	Battersea - - -	150,558	13	1	12	—	12	3	9	3	10	1	10	1	4	4
	Wandsworth - -	156,942	5	3	13	—	4	—	3	1	12	1	10	3	11	—
	Camberwell - - -	235,344	26	6	21	10	26	9	16	2	22	4	24	3	11	7
	Greenwich - - -	165,413	14	1	13	2	8	6	16	5	13	3	14	—	14	2
	Lewisham - - -	92,647	3	—	3	—	2	1	4	—	4	—	1	—	4	—
	Woolwich - - -	40,848	1	—	—	—	4	—	3	1	4	—	2	3	3	—
	Plumstead - - -	72,158	2	2	4	—	7	1	3	—	6	—	7	3	2	1
	Lee - - - -	16,381	4	1	1	1	—	—	1	—	—	—	—	—	1	1
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

Diphtheria—*continued.*

Weekly Statement, 4th Quarter, 1894—*continued.*												Totals for 4th Quarter, 1894.		Grand Totals for Year 1894.		Sanitary Areas.
Nov. 24.		Dec. 1.		Dec. 8.		Dec. 15.		Dec. 22.		Dec. 29.						
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
218	48	230	53	213	54	198	53	192	35	176	34	2,915	645	11,145	2,637	London.
209	—	*220*	—	*204*	—	*189*	—	*190*	—	*172*	—	*2,792*	—	*10,676*	—	(*Administrative County.*)
2	2	7	—	15	4	3	3	4	—	6	—	100	27	280	77	Kensington.
15	2	6	2	14	5	11	1	12	2	8	1	120	28	333	105	Fulham.
6	—	9	—	4	3	3	—	2	1	7	1	65	16	186	50	Hammersmith.
9	1	9	5	7	—	5	—	5	—	7	1	108	18	394	93	Paddington.
8	1	9	2	5	1	9	2	3	—	6	—	76	16	253	52	Chelsea.
3	—	2	—	—	—	1	1	3	—	3	—	37	7	119	19	St. George, Hanover Sq.*
—	2	2	—	4	2	4	1	1	—	1	—	29	9	85	26	Westminster.
—	1	—	—	1	—	2	—	—	—	2	—	12	3	40	15	St. James, Westminster.
9	1	5	2	7	1	5	2	2	1	6	—	69	12	287	73	St. Marylebone.
1	—	1	—	3	—	—	—	2	—	—	—	24	—	89	19	Hampstead.
7	1	10	1	7	3	4	2	6	1	6	2	120	26	540	118	St. Pancras.
9	—	18	—	10	6	14	4	9	3	12	3	163	41	890	221	Islington.
—	—	3	—	—	—	2	—	—	—	—	—	16	2	42	5	St. Mary, Stoke Newington.
16	3	8	5	12	3	10	2	10	1	16	2	153	34	576	123	Hackney.
—	—	1	—	2	—	1	—	—	—	1	1	16	2	51	14	St. Giles and St. George, Bloomsbury.
1	—	2	—	—	—	—	—	—	—	1	—	9	2	16	6	St. Martin-in the-Fields.
1	—	—	2	1	—	—	—	1	—	2	—	6	3	26	9	Strand.†
—	—	1	—	1	—	2	—	1	—	1	1	14	4	75	20	Holborn.‡
1	—	2	—	—	—	10	2	2	—	2	1	47	7	181	34	Clerkenwell.
—	1	1	—	1	—	1	—	—	—	1	—	9	3	64	15	St. Luke, Middlesex.
1	—	—	—	—	—	1	—	2	—	—	—	11	—	47	6	London, City of.§
11	3	9	1	6	—	4	—	3	—	4	1	75	12	298	75	Shoreditch.
11	2	6	1	3	—	8	2	13	2	11	2	124	22	537	133	Bethnal Green.
2	1	5	3	10	—	4	1	3	1	1	—	45	15	184	46	Whitechapel.‖
1	—	5	2	5	—	3	3	2	—	3	1	37	10	215	51	St. George-in-the-East.
1	1	6	1	8	1	5	5	3	2	5	1	62	20	189	51	Limehouse.
4	1	10	1	2	2	8	3	5	1	2	1	89	18	353	81	Mile End Old Town.
10	1	12	1	10	1	10	—	9	2	13	2	155	20	656	106	Poplar.
—	—	3	—	3	1	1	2	1	—	—	—	23	6	84	20	St. Saviour, Southwark.
5	—	2	2	2	—	—	—	2	1	3	1	47	13	183	49	St. George, Southwark.
8	3	6	2	6	—	1	1	6	1	4	—	66	17	308	61	Newington.
1	—	1	—	1	—	—	—	1	—	1	—	11	—	29	3	St. Olave, Southwark.
6	3	5	1	3	2	1	—	2	—	1	—	35	12	273	66.	Bermondsey.
—	—	3	1	—	2	1	—	1	—	1	—	30	6	150	31.	Rotherhithe.
16	4	11	3	10	6	9	2	13	2	5	4	164	42	626	141	Lambeth.
11	3	12	2	5	2	8	3	18	5	3	1	127	29	489	116	Battersea.
8	2	5	—	5	1	6	3	4	1	3	—	89	15	327	80	Wandsworth.
18	8	18	7	13	4	13	4	16	2	8	2	232	68	719	192	Camberwell.
12	1	7	1	19	2	19	3	15	4	12	3	176	33	574	132	Greenwich.
3	—	1	—	—	—	3	—	4	—	4	—	36	1	154	30.	Lewisham.
1	—	4	2	1	1	2	—	2	1	—	—	27	8	51	14	Woolwich.
—	—	3	3	5	1	4	1	2	1	1	1	46	14	134	36.	Plumstead.
—	—	—	—	—	—	—	—	2	—	3	1	12	4	33	21	Lee.
—	—	—	—	2	—	—	—	—	—	—	—	3	—	5	—	Port of London

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136) Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 368).

	Sanitary Areas.	Population (1891).	Enteric Fever.											
			Weekly Statement, 1st Quarter, 1894.											
			Jan. 6.		Jan. 13.		Jan. 20.		Jan. 27.		Feb. 3.		Feb. 10.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - - -	4,232,118	[a]45	10	41	15	52	11	60	12	52	14	60	6
	(*Administrative County*) -	- -	[b]*42*	—	*39*	—	*51*	—	*60*	—	*59*	—	*58*	—
W. District.	Kensington - - -	166,308	2	1	3	1	1	—	1	2	1	1	—	—
	Fulham - - -	91,639	—	—	1	—	—	—	—	—	—	1	2	—
	Hammersmith - -	97,239	—	—	—	—	1	—	1	—	2	—	—	—
	Paddington - - -	117,846	2	1	2	1	3	—	—	—	—	—	1	—
	Chelsea - - -	96,253	—	—	3	1	—	—	—	—	—	1	2	—
	St. George, Hanover Sq.* -	78,599	—	1	1	—	2	—	—	2	—	—	1	—
	Westminster - -	55,539	—	—	—	—	2	—	1	—	—	1	1	—
	St. James, Westminster -	24,995	—	—	—	—	1	—	—	—	—	—	—	—
N. District.	St. Marylebone - -	142,404	2	—	—	—	4	—	2	—	3	2	3	—
	Hampstead - - -	68,416	1	—	2	—	—	—	—	—	—	—	2	—
	St. Pancras - - -	234,379	5	—	3	1	2	2	—	—	4	2	3	1
	Islington - - -	319,143	4	—	3	1	6	1	8	—	3	2	2	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney - - -	198,606	4	—	4	—	5	1	2	1	2	—	3	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	1	—	2	—	—	—
	St. Martin-in-the-Fields -	14,616	1	—	—	—	1	—	1	—	—	—	—	—
	Strand† - - -	25,217	—	—	—	1	—	—	—	—	—	—	1	—
	Holborn‡ - - -	34,043	1	—	—	—	1	—	3	1	—	—	1	—
	Clerkenwell - - -	66,216	—	—	1	—	—	—	3	—	—	1	—	—
	St. Luke, Middlesex -	42,440	—	—	1	—	—	—	—	—	—	—	1	—
	London, City of§ - -	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch - - -	124,009	1	—	—	—	3	—	3	—	—	—	2	—
	Bethnal Green - -	129,132	5	—	2	4	2	—	6	—	5	1	3	2
	Whitechapel‖ - -	74,420	—	—	—	1	—	1	2	—	2	—	2	1
	St. George-in-the-East -	45,795	1	—	—	—	3	1	2	1	5	1	1	—
	Limehouse - - -	57,376	—	—	—	—	—	—	1	1	—	—	2	—
	Mile End Old Town -	107,592	1	—	1	—	—	1	4	—	—	—	3	—
	Poplar - - -	166,748	1	—	3	1	1	—	7	1	7	1	4	—
S. District.	St. Saviour, Southwark -	27,177	—	—	—	—	—	—	—	—	—	—	1	—
	St. George, Southwark -	59,712	—	—	—	—	—	—	—	—	1	—	—	—
	Newington - - -	115,804	2	—	3	1	2	—	—	—	—	—	1	—
	St. Olave, Southwark -	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey - - -	84,682	—	1	—	—	1	—	—	—	1	—	2	—
	Rotherhithe - - -	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth - - -	275,203	6	4	2	—	1	3	6	—	4	—	1	—
	Battersea - - -	150,558	2	1	1	—	3	—	2	2	2	—	6	1
	Wandsworth - -	156,942	1	—	2	—	4	1	2	—	—	—	1	—
	Camberwell - - -	235,344	1	—	1	—	1	—	—	—	1	—	1	—
	Greenwich - - -	165,413	1	—	1	—	1	—	1	—	3	—	3	—
	Lewisham - - -	92,647	1	—	—	1	—	—	—	1	—	—	1	—
	Woolwich - - -	40,848	—	1	—	1	1	—	—	—	—	—	1	1
	Plumstead - - -	72,158	—	—	1	—	—	—	—	—	4	—	1	—
	Lee - - - -	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	—	—	—	—	1	—	—	—	1	—

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[a] Totals of actual *notifications*.

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95)

ENTERIC FEVER—*continued.*																
Weekly Statement, 1st Quarter, 1894—*continued.*														Totals for 1st Quarter, 1894.		Sanitary Areas.
Feb. 17.		Feb. 24.		March 3.		March 10.		March 17.		March 24.		March 31.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
62	8	58	4	46	12	62	10	45	14	45	9	37	11	665	136	London.
60	—	*55*	—	*46*	—	*59*	—	*44*	—	*45*	—	*35*	—	*646*	—	(*Administrative County.*)
1	—	1	—	—	—	1	—	1	—	3	—	—	—	15	5	Kensington.
—	—	—	—	1	—	—	—	—	—	—	—	1	—	5	1	Fulham.
—	1	1	—	1	—	2	1	1	1	2	—	1	—	12	3	Hammersmith.
1	—	1	—	3	1	1	—	—	1	1	—	1	—	16	4	Paddington.
5	—	1	—	3	2	4	—	1	—	1	—	2	1	22	5	Chelsea.
1	—	—	—	—	—	1	—	1	1	—	—	—	—	7	4	St. George, Hanover Sq.*
—	—	—	—	2	—	3	—	—	—	—	—	—	—	9	1	Westminster.
—	—	—	—	—	—	1	—	—	1	—	—	—	—	2	1	St. James, Westminster.
5	—	2	2	1	1	3	—	—	—	—	—	3	1	28	6	St. Marylebone.
2	—	1	—	1	—	—	1	1	—	—	—	—	—	10	1	Hampstead.
3	1	7	—	1	—	2	2	3	1	4	—	—	1	37	11	St. Pancras.
4	1	3	—	4	—	2	1	5	—	—	—	4	2	48	8	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
8	—	5	2	4	1	4	1	4	1	1	—	4	1	50	8	Hackney.
1	1	—	—	—	—	—	—	—	—	—	—	—	—	4	1	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	1	—	—	—	—	—	—	3	1	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	Strand.†
1	—	—	—	1	—	2	—	—	—	—	—	—	—	10	1	Holborn.‡
5	—	1	—	—	—	2	—	4	—	1	—	—	—	17	1	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	St. Luke, Middlesex.
—	—	—	—	1	—	—	—	1	—	—	—	—	—	2	—	London, City of.§
2	—	—	—	2	—	1	—	2	—	1	1	—	—	17	1	Shoreditch.
1	—	—	—	—	—	2	—	4	1	—	—	1	—	31	8	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	3	Whitechapel.‖
—	—	3	—	1	—	—	—	1	—	2	—	—	—	19	8	St. George-in-the-East.
—	—	1	—	—	—	1	—	1	1	4	1	—	1	10	4	Limehouse.
—	—	—	—	1	—	3	—	1	1	—	—	1	—	15	2	Mile End Old Town.
4	—	4	—	4	1	6	—	—	1	3	1	—	—	44	6	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George, Southwark.
2	—	3	—	1	—	1	—	—	1	—	—	3	2	18	4	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
1	1	3	—	—	1	—	—	—	—	2	—	1	—	11	3	Bermondsey.
—	—	1	—	—	—	1	—	—	—	1	—	1	—	4	—	Rotherhithe.
2	—	3	—	4	2	2	—	4	—	6	2	6	1	47	12	Lambeth.
2	1	3	—	—	—	1	—	2	—	1	—	1	—	26	5	Battersea.
3	1	—	—	3	1	4	—	1	—	1	1	1	—	23	4	Wandsworth.
—	—	1	—	1	—	3	1	3	1	3	3	2	1	18	6	Camberwell.
7	1	10	—	4	2	6	1	2	1	3	—	—	—	47	5	Greenwich.
—	—	—	—	1	—	1	1	—	—	—	—	2	—	6	3	Lewisham.
—	—	—	—	—	—	1	—	2	1	—	—	1	—	6	4	Woolwich.
1	—	3	—	1	—	1	—	—	—	—	—	—	—	12	—	Plumstead
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	Lee
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

Enteric Fever—*continued.*

Weekly Statement, 2nd Quarter, 1894.

	Sanitary Areas.	Population (1891).	April 7.		April 14.		April 21.		April 28.		May 5.		May 12.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]55	6	44	9	44	7	47	9	38	7	44	9
	(*Administrative County*)		[b]*53*	—	*44*	—	*41*	—	*41*	—	*36*	—	*43*	—
W. District.	Kensington	166,308	2	—	—	—	—	—	4	1	1	—	1	—
	Fulham	91,639	1	—	—	—	—	—	2	—	—	—	1	—
	Hammersmith	97,239	2	—	—	—	2	—	—	1	—	1	—	2
	Paddington	117,846	3	—	1	—	—	—	1	1	—	—	4	—
	Chelsea	96,253	—	—	1	—	1	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	1	—	1	—	—	—	—	—	1	—
	Westminster	55,539	1	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	3	—	1	—	5	1	1	—	4	1	1	—
	Hampstead	68,416	2	—	1	—	2	—	—	—	—	—	—	—
	St. Pancras	234,379	2	—	1	1	2	—	6	—	—	—	2	1
	Islington	319,143	2	1	2	1	3	—	1	—	1	1	1	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	3	1	2	—	—	—	1	—	4	—	3	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	1	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	1	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	1	—	—	—	1	—	1	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of §	37,583	2	1	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	1	—	1	—	—	1	3	—	—	1	—	—
	Bethnal Green	129,132	2	—	1	—	5	—	8	1	5	—	3	1
	Whitechapel‖	74,420	—	—	1	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	2	—	1	—	1	—	—	—	—	—	1	—
	Limehouse	57,376	—	—	—	—	—	—	1	1	—	—	1	—
	Mile End Old Town	107,592	1	—	2	—	1	1	—	—	—	—	1	—
	Poplar	166,748	—	—	2	—	1	—	3	—	4	1	6	1
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	1	—
	St. George, Southwark	59,712	2	—	—	—	1	—	—	—	—	—	—	—
	Newington	115,804	—	—	2	—	2	—	—	—	1	—	2	1
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	1	—	—	—	—	—	1	—	—	—
	Rotherhithe	39,255	1	—	—	—	—	—	1	—	—	—	—	—
	Lambeth	275,203	14	3	13	3	6	1	3	1	7	—	3	—
	Battersea	150,558	1	—	—	1	3	2	1	—	2	—	—	—
	Wandsworth	156,942	3	—	4	2	1	1	3	—	2	—	2	—
	Camberwell	235,344	3	—	4	—	2	—	1	—	1	—	3	—
	Greenwich	165,413	—	—	2	—	1	—	3	1	1	—	1	1
	Lewisham	92,647	—	—	—	—	2	—	—	—	1	1		—
	Woolwich	40,848	1	—	—	—	—	—	—	—	—	—	—	—
	Plumstead	72,158	1	—	—	1	1	—	3	1	1	1	1	1
	Lee	16,381	—	—	—	—	—	—	—	—	1	—	—	—
	Port of London	—	—	—	—	—	—	—	1	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

Enteric Fever—*continued.*																
Weekly Statement, 2nd Quarter, 1894—*continued.*														Totals for 2nd Quarter, 1894.		Sanitary Areas.
May 19.		May 26.		June 2.		June 9.		June 16.		June 23.		June 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
42	8	47	14	35	12	47	10	55	9	37	10	35	9	370	119	London..
41	—	*45*	—	*35*	—	*46*	—	*55*	—	*35*	—	*35*	—	*550*	—	(*Administrative County.*)
2	1	—	—	—	—	1	—	2	—	1	—	1	—	15	2	Kensington.
—	—	—	—	2	—	1	—	1	—	1	—	1	—	10	—	Fulham..
1	—	1	—	—	—	—	—	—	—	—	2	1	—	7	6	Hammersmith.
2	—	—	2	—	1	—	—	3	—	1	1	1	—	16	5	Paddington.
1	—	—	—	1	—	3	—	2	—	1	—	1	—	11	—	Chelsea. .
3	—	2	—	—	—	1	—	—	—	—	—	—	—	9	—	St. George, Hanover Sq.*
—	—	2	—	3	—	—	—	—	—	1	—	2	—	9	—	Westminster.
1	—	—	—	1	1	—	—	—	—	1	1	—	—	3	2	St. James, Westminster.
3	—	1	1	—	—	3	1	—	—	—	—	1	1	23	5	St. Marylebone.
2	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—	Hampstead.
2	—	2	—	2	—	1	—	3	—	6	1	4	—	33	3	St. Pancras.
4	—	3	—	5	1	4	2	4	1	5	—	3	—	38	7	Islington.
—	—	3	—	—	—	—	—	3	—	—	—	—	—	6	—	St. Mary, Stoke Newington.
2	1	2	2	2	1	—	—	3	—	—	—	3	—	25	6	Hackney.
1	1	1	1	2	—	1	—	1	—	1	—	—	—	8	2	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	2	Strand.† .
1	—	—	—	—	—	1	—	1	2	1	—	—	1	4	4	Holborn.‡
3	—	4	—	—	—	—	—	—	—	1	—	3	—	14	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. Luke, Middlesex.
—	—	2	—	—	—	—	—	—	—	—	—	1	—	5	1	London, City of.§
1	—	—	—	1	—	—	—	1	—	2	1	—	—	10	3	Shoreditch.
—	—	5	—	2	—	5	1	6	2	2	2	1	2	45	9	Bethnal Green.
—	—	1	—	1	1	—	—	—	—	—	—	1	—	4	1	Whitechapel.‖
—	—	—	—	—	—	1	1	—	—	—	—	—	—	6	1	St. George-in-the-East.
—	—	—	—	—	—	—	—	4	—	1	—	—	—	7	1	Limehouse.
—	—	1	1	—	—	—	—	1	—	2	—	—	—	9	2	Mile End Old Town.
3	1	1	1	2	1	—	—	6	1	3	1	1	1	32	8	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	St. Saviour, Southwark.
—	—	1	—	3	1	2	1	2	—	—	—	—	—	11	2	St. George, Southwark.
—	—	1	—	—	1	2	—	1	—	1	—	—	1	12	3	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	3	—	Bermondsey.
—	—	—	1	1	—	1	—	1	—	—	—	1	—	6		Rotherhithe.
5	2	1	—	1	—	3	—	2	1	1	—	2	—	61	1	Lambeth.
3	—	2	—	2	1	4	—	3	—	—	—	—	3	21	7	Battersea.
1	—	2	2	1	1	3	—	2	—	—	—	1	—	25	6	Wandsworth.
—	—	2	—	1	—	3	1	1	—	1	—	1	—	23	1	Camberwell.
1	1	5	2	1	1	4	2	—	—	2	—	3	—	24	8	Greenwich.
—	—	—	1	1	—	—	—	—	—	1	1	—	—	8	3	Lewisham.
—	—	1	—	—	—	1	—	—	1	—	—	—	—	3	1	Woolwich.
—	—	—	—	—	—	1	1	1	—	—	—	—	—	9	5	Plumstead.
—	—	1	—	—	1	1	—	—	—	—	—	1	—	4	1	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	ENTERIC FEVER—*continued.*											
			Weekly Statement, 3rd Quarter, 1894.											
			July 7.		July 14.		July 21.		July 28.		Aug. 4.		Aug. 11.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London - - -	**4,232,118**	[a]**33**	**3**	**38**	**5**	**42**	**7**	**50**	**5**	**55**	**6**	**48**	**11**
	(*Administrative County*) -	- -	[b]*33*	—	*33*	—	*41*	—	*47*	—	*53*	—	*48*	—
W. District.	**Kensington** - - -	**166,308**	—	—	**2**	—	**2**	**1**	—	**1**	—	—	**4**	—
	Fulham - - -	**91,639**	—	—	—	—	—	—	**2**	—	**1**	—	—	—
	Hammersmith - -	**97,239**	—	—	—	—	**1**	—	—	—	—	—	**1**	—
	Paddington - - -	**117,846**	—	**1**	**2**	—	**1**	—	**4**	**1**	**4**	—	—	—
	Chelsea - - -	**96,253**	**1**	—	—	—	**3**	—	**2**	**1**	—	—	**1**	—
	St. George, Hanover Sq.* -	**78,599**	—	—	—	—	**1**	—	**1**	—	—	**1**	**1**	—
	Westminster - -	**55,539**	**1**	—	**1**	—	—	—	—	—	**2**	—	—	—
	St. James, Westminster -	**24,995**	—	—	**1**	—	—	—	—	—	—	—	—	—
N. District.	**St. Marylebone** - -	**142,404**	**2**	—	**1**	**1**	**3**	**1**	—	**1**	**3**	**1**	**3**	—
	Hampstead - - -	**68,416**	**1**	—	—	—	**2**	**1**	**2**	—	**1**	—	**1**	—
	St. Pancras - - -	**234,379**	**1**	—	**3**	—	**4**	—	**4**	—	**1**	—	**2**	**2**
	Islington - - -	**319,143**	**3**	—	**4**	—	**2**	**1**	**3**	—	**4**	—	**6**	**2**
	St. Mary, Stoke Newington	**30,936**	—	—	—	—	**1**	—	—	—	—	—	**1**	**1**
	Hackney - - -	**198,606**	**1**	—	—	**2**	**2**	—	—	—	**2**	—	**1**	—
Central District.	**St. Giles and St. George Bloomsbury.**	**39,782**	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields -	**14,616**	—	—	—	—	—	—	—	—	—	—	—	—
	Strand† - - -	**25,217**	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡ - - -	**34,043**	**1**	—	**3**	**1**	**1**	—	**1**	—	**1**	—	—	—
	Clerkenwell - - -	**66,216**	—	**1**	—	—	**2**	—	**2**	—	**2**	**1**	**4**	—
	St. Luke, Middlesex -	**42,440**	—	**1**	—	—	—	—	**1**	—	—	**1**	—	—
	London, City of§ - -	**37,583**	**2**	—	**1**	—	—	—	—	—	—	—	—	—
E. District.	**Shoreditch** - - -	**124,009**	**2**	—	—	—	**1**	—	—	—	**2**	—	**2**	**1**
	Bethnal Green - -	**129,132**	**5**	—	**3**	—	**1**	**1**	**1**	—	**2**	—	**3**	—
	Whitechapel‖ - -	**74,420**	**1**	—	**1**	—	**1**	—	—	—	**2**	—	**1**	—
	St. George-in-the-East -	**45,795**	**1**	—	—	—	—	—	—	—	—	—	—	—
	Limehouse - - -	**57,376**	**1**	—	—	—	—	—	—	—	—	—	**2**	—
	Mile End Old Town -	**107,592**	**2**	—	**1**	—	—	—	—	—	**1**	—	**2**	**1**
	Poplar - - -	**166,748**	**2**	—	**3**	—	**2**	—	**5**	—	**3**	—	**1**	**1**
S. District.	**St. Saviour, Southwark** -	**27,177**	—	—	—	—	—	—	—	—	—	—	**1**	**1**
	St. George, Southwark -	**59,712**	—	—	—	—	—	—	**1**	—	**2**	—	—	—
	Newington - - -	**115,804**	**1**	—	—	—	**2**	—	**1**	—	**3**	—	—	—
	St. Olave, Southwark -	**12,723**	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey - - -	**84,682**	—	—	—	—	—	—	**3**	—	**2**	—	**3**	—
	Rotherhithe - - -	**39,255**	—	—	—	—	—	—	—	—	**2**	—	—	—
	Lambeth - - -	**275,203**	**1**	—	**1**	**1**	**3**	**1**	**2**	—	**3**	—	**4**	**1**
	Battersea - - -	**150,558**	**1**	—	**2**	—	**2**	—	**5**	—	**4**	**1**	**2**	—
	Wandsworth - -	**156,942**	**1**	—	**2**	—	—	—	**2**	—	**2**	—	—	—
	Camberwell - - -	**235,344**	**1**	—	**1**	—	**2**	—	**4**	**1**	**4**	—	—	—
	Greenwich - - -	**165,413**	**1**	—	**1**	—	**3**	**1**	**3**	—	**1**	**1**	**2**	—
	Lewisham - - -	**92,647**	—	—	—	—	—	—	—	—	**1**	—	—	—
	Woolwich - - -	**40,818**	—	—	—	—	—	—	—	—	—	—	—	**1**
	Plumstead - - -	**73,158**	—	—	—	—	—	—	**1**	—	—	—	—	—
	Lee - - - -	**16,381**	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

ENTERIC FEVER—*continued.*

Weekly Statement, 3rd Quarter, 1894—*continued.* Aug. 18.		Aug. 25.		Sept. 1.		Sept. 8.		Sept. 15.		Sept. 22.		Sept. 29.		Totals for 3rd Quarter, 1894.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
47	6	39	10	62	6	66	12	71	9	94	6	107	13	747	99	London.
45	—	*40*	—	*63*	—	*61*	—	*67*	—	*84*	—	*93*	—	*708*	—	(*Administrative County*).
2	—	1	—	—	—	—	—	1	—	1	—	4	—	17	2	Kensington.
—	—	2	1	3	1	—	—	—	—	—	—	3	—	11	2	Fulham.
1	—	—	—	—	1	2	—	1	—	—	—	2	—	8	1	Hammersmith.
—	—	—	1	1	—	2	—	2	1	—	—	—	1	16	5	Paddington.
—	1	—	—	1	—	4	—	7	—	1	—	4	1	24	3	Chelsea.
—	1	—	—	1	—	—	—	—	—	1	1	2	—	7	3	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	1	—	5	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. James, Westminster.
4	—	1	1	4	—	2	—	4	2	—	—	1	—	28	7	St. Marylebone.
—	—	—	—	1	—	—	—	—	—	2	—	—	1	10	2	Hampstead.
3	—	1	1	4	—	4	1	8	2	11	—	9	1	54	7	St. Pancras.
3	—	4	—	3	—	4	1	7	—	9	1	12	—	64	5	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	St. Mary, Stoke Newington.
2	—	3	1	4	—	5	1	5	—	5	—	5	1	33	5	Hackney.
—	—	—	—	1	—	—	—	—	—	1	—	—	—	2	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	1	—	1	—	2	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	3	—	—	1	—	—	—	—	—	—	10	2	Holborn.‡
4	—	2	—	1	—	—	1	1	—	1	—	1	—	20	3	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	2	St. Luke, Middlesex.
1	—	1	—	2	1	—	—	2	—	—	—	—	—	9	1	London, City of.§
2	—	—	—	—	—	4	—	1	—	3	—	4	2	21	3	Shoreditch.
2	1	—	—	1	—	1	—	3	—	2	—	4	1	28	3	Bethnal Green.
1	—	—	—	1	—	—	—	1	1	—	—	1	—	10	1	Whitechapel.‖
—	—	1	—	1	1	3	—	1	—	3	—	4	—	14	1	St. George-in-the-East.
1	—	1	1	1	—	—	—	—	—	—	—	3	—	9	1	Limehouse.
—	—	—	1	1	—	—	—	1	—	4	—	5	1	17	3	Mile End Old Town.
6	1	4	—	3	—	4	2	8	—	7	—	5	—	53	4	Poplar.
2	—	—	1	—	—	1	—	—	—	—	—	—	—	4	2	St. Saviour, Southwark.
—	1	—	—	—	—	2	—	—	—	3	—	—	—	8	1	St. George, Southwark.
1	—	3	1	4	1	1	—	4	1	9	—	6	—	35	3	Newington.
—	—	—	—	—	—	—	2	—	1	—	—	—	2	—	5	St. Olave, Southwark.
1	—	1	—	—	—	9	—	—	—	4	—	—	—	23	—	Bermondsey.
—	—	—	—	—	—	1	—	—	—	1	—	—	—	4	—	Rotherhithe.
2	—	6	—	6	—	5	1	3	—	5	3	11	—	52	7	Lambeth.
1	1	2	—	4	—	1	1	1	1	2	—	5	1	32	5	Battersea.
—	—	—	—	4	—	1	—	1	—	1	—	4	—	18	—	Wandsworth.
1	—	1	—	2	—	—	—	3	—	5	1	3	—	28	2	Camberwell.
3	—	4	1	4	1	6	1	3	—	10	—	4	—	45	5	Greenwich.
1	—	1	—	—	—	1	—	—	—	—	—	3	—	7	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	Woolwich.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Plumstead.
—	—	—	—	—	—	2	—	—	—	1	—	—	1	3	1	Lee.
2	—	—	—	1	—	1	—	3	—	—	—	—	—	7	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn, (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

ENTERIC FEVER—*continued.*

Weekly Statement, 4th Quarter, 1894.

	Sanitary Areas.	Population (1891).	Oct. 6.		Oct. 13.		Oct. 20.		Oct. 27.		Nov. 3.		Nov. 10.		Nov. 17.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	ᵃ105	11	82	19	91	17	108	14	115	16	110	24	186	21
	(*Administrative County*)	-	ᵇ*98*	—	*79*	—	*85*	—	*103*	—	*105*	—	*109*	—	*131*	—
W. District.	Kensington	166,308	3	1	1	1	1	—	1	—	1	1	6	—	4	1
	Fulham	91,639	1	—	—	1	—	—	1	—	2	—	1	—	2	1
	Hammersmith	97,239	3	—	2	—	1	—	—	—	3	1	1	—	4	1
	Paddington	117,846	1	—	3	—	3	—	—	—	—	—	1	—	1	—
	Chelsea	96,253	4	—	1	1	3	1	2	—	3	—	3	—	5	—
	St. George, Hanover	78,599	3	—	1	—	—	1	4	1	8	—	4	—	4	—
	Westminster*	55,539	2	—	—	—	—	—	1	—	3	1	3	—	2	—
	St. James, Westminster	24,995	—	1	3	1	1	—	—	—	2	—	1	1	1	—
N. District.	St. Marylebone	142,404	3	—	3	—	5	—	2	—	9	2	4	—	11	—
	Hampstead	68,416	—	—	—	—	3	—	3	—	—	—	—	—	2	—
	St. Pancras	234,379	8	1	7	1	5	2	8	1	5	1	10	4	5	—
	Islington	319,143	11	2	14	—	9	3	12	—	11	1	10	3	8	2
	St. Mary, Stoke Newington	30,936	1	—	—	—	—	—	2	—	—	—	1	1	1	—
	Hackney	198,606	7	2	5	2	2	—	9	2	9	2	7	—	8	1
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	1	2	1	1	1	—	—	2	—	2	1
	St. Martin-in-the-Fields	14,616	—	—	—	1	1	—	3	—	—	—	2	—	—	—
	Strand†	25,217	—	—	2	—	—	—	—	—	1	—	3	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	1	—	—	—	—	—
	Clerkenwell	66,216	—	—	1	1	5	—	—	—	—	—	—	1	3	1
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	1	1	1	—	1	—
	London, City of§	37,583	1	—	—	1	2	—	1	1	—	—	1	—	—	—
E. District.	Shoreditch	124,009	5	2	3	1	6	—	3	—	1	—	4	—	2	—
	Bethnal Green	129,132	5	—	1	—	8	2	4	—	9	1	2	2	4	1
	Whitechapel‖	74,420	—	—	6	—	—	1	—	—	1	—	1	—	2	—
	St. George-in-the-East	45,705	2	1	2	—	—	—	2	—	1	—	—	—	2	—
	Limehouse	57,376	2	—	—	—	—	—	1	—	1	—	2	1	3	1
	Mile End Old Town	107,592	5	1	1	—	3	1	2	1	9	—	3	—	3	1
	Poplar	166,748	10	—	3	3	4	—	14	—	9	—	8	2	14	2
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	1	—	—	—	—	1	—	—	1	—	2	—
	Newington	115,804	1	—	4	1	3	—	1	—	1	1	2	—	1	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	2	—	—	—
	Bermondsey	84,682	1	—	—	—	—	—	1	—	2	1	2	1	1	1
	Rotherhithe	39,255	1	—	—	—	1	—	—	—	—	—	1	—	—	—
	Lambeth	275,203	5	—	4	2	10	1	5	2	5	—	5	—	8	2
	Battersea	150,558	1	—	2	—	1	—	6	—	2	1	2	1	9	1
	Wandsworth	156,942	5	—	2	—	3	—	3	—	1	—	6	2	10	3
	Camberwell	235,344	6	—	4	—	3	3	6	1	5	2	—	1	4	—
	Greenwich	165,413	4	—	2	1	4	1	6	3	9	—	5	3	4	—
	Lewisham	92,647	1	—	2	—	1	—	3	—	—	—	1	1	2	—
	Woolwich	40,848	—	—	—	—	—	—	1	—	—	—	—	—	—	—
	Plumstead	72,158	1	—	1	—	1	—	—	—	—	—	—	—	—	1
	Lee	16,381	—	—	1	—	—	—	—	—	—	—	2	—	1	—
	Port of London	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—

ᵃ Totals of actual *notifications.*

ᵇ Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

ENTERIC FEVER—*continued.*

Weekly Statement, 4th Quarter, 1894—*continued.*												Totals for 4th Quarter, 1894.		Grand Totals for Year 1894.		Sanitary Areas.
Nov. 24.		Dec. 1.		Dec. 8.		Dec. 15.		Dec. 22.		Dec. 29.						
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
116	23	133	15	145	17	143	24	151	22	109	34	1,544	254	3,526	608	London.
105	—	*130*	—	*135*	—	*139*	—	*147*	—	*101*	—	*1,467*	—	*3,371*	—	(*Administrative County.*)
3	2	4	1	4	—	6	1	4	—	7	4	45	12	92	21	Kensington.
—	—	1	—	1	—	1	—	5	—	1	—	16	2	42	5	Fulham:
3	—	1	1	5	—	1	1	3	—	3	1	30	5	57	15	Hammersmith.
—	—	1	—	5	1	8	—	1	1	3	3	27	5	75	19	Paddington.
2	3	3	1	5	—	3	—	5	—	2	—	41	6	98	14	Chelsea.
6	1	2	—	4	1	5	—	6	—	1	1	48	5	71	12	St. George, Hanover Sq.*
1	1	2	—	3	—	—	1	2	—	1	1	20	4	43	5	Westminster.
1	—	4	—	—	1	3	—	2	—	1	1	19	5	25	8	St. James, Westminster.
8	1	5	—	7	—	12	1	12	1	2	—	83	5	162	23	St. Marylebone.
8	1	1	1	5	1	1	—	1	—	2	—	26	3	53	6	Hampstead.
7	4	8	—	7	—	7	1	6	1	8	1	91	17	215	38	St. Pancras.
3	—	9	1	8	1	14	—	14	1	6	2	129	16	279	36	Islington.
—	—	—	—	—	—	—	—	2	—	1	1	8	2	16	3	St. Mary, Stoke Newington.
9	1	9	1	10	3	4	3	9	2	4	—	92	19	202	38	Hackney.
1	—	1	—	4	—	4	1	1	—	1	—	19	5	33	8	St. Giles and St. George, Bloomsbury.
—	—	—	—	1	—	3	—	—	—	—	—	10	1	15	2	St. Martin-in-the-Fields.
1	—	1	—	4	—	1	2	—	1	2	1	15	4	16	7	Strand.†
2	—	—	—	—	—	2	—	1	—	1	—	7	—	31	7	Holborn.‡
1	—	1	—	—	—	1	—	3	—	1	1	16	4	67	8	Clerkenwell.
2	—	1	—	1	—	1	—	1	—	2	—	11	1	16	3	St. Luke, Middlesex.
4	1	—	—	1	1	1	—	3	—	4	—	18	4	34	6	London, City of.§
1	—	4	—	3	—	2	—	2	1	3	1	39	5	87	12	Shoreditch.
2	—	3	—	1	—	6	—	2	—	2	1	49	7	153	27	Bethnal Green.
—	—	2	—	2	1	1	—	3	2	2	1	20	5	40	10	Whitechapel.‖
3	—	1	—	3	—	2	—	1	—	1	—	20	1	59	6	St. George-in-the-East.
—	—	6	—	2	—	1	—	1	—	2	—	21	2	47	8	Limehouse.
—	—	4	—	7	—	3	—	2	2	—	—	42	6	83	13	Mile End Old Town.
7	1	9	2	3	1	4	—	6	1	3	1	94	13	223	31	Poplar.
1	—	—	—	—	—	—	—	—	—	2	—	3	—	10	2	St. Saviour, Southwark.
2	1	2	—	2	—	—	—	—	—	—	—	10	2	30	5	St. George, Southwark.
2	1	—	—	6	—	2	—	6	1	1	—	30	4	95	14	Newington.
—	—	1	—	—	—	—	—	—	—	3	—	6	—	6	—	St. Olave, Southwark.
1	1	1	—	2	1	2	2	—	1	4	—	17	8	54	16	Bermondsey.
5	—	1	1	1	—	—	—	1	—	—	—	11	1	25	2	Rotherhithe.
5	—	10	—	12	2	16	2	9	3	8	2	102	16	262	46	Lambeth.
6	1	11	2	6	3	12	1	7	—	7	1	72	11	151	28	Battersea.
9	—	8	2	6	—	7	2	7	—	4	2	71	11	137	21	Wandsworth.
5	1	4	1	4	—	3	1	9	2	7	1	60	13	129	22	Camberwell.
1	2	4	1	3	—	2	1	9	1	3	1	56	14	172	32	Greenwich.
1	—	3	—	6	—	2	3	5	—	1	4	28	8	49	14	Lewisham.
—	—	1	—	—	—	—	—	—	—	1	—	3	—	12	6	Woolwich.
1	—	2	—	—	—	—	—	—	—	1	—	7	1	30	6	Plumstead.
2	—	2	—	—	—	—	1	—	—	1	—	9	1	17	3	Lee.
—	—	—	—	1	—	—	—	—	—	—	—	3	—	13	—	Port of London.

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‡ Including Gray's Inn (population, 258), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	Simple Continued Fever.											
			Weekly Statement, 1st Quarter, 1894.											
			Jan. 6.		Jan. 13.		Jan. 20.		Jan. 27.		Feb. 3.		Feb. 10.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]1	—	3	1	2	3	1	—	1	—	3	—
	(*Administrative County*)		[b]*1*	—	*3*	—	*2*	—	*1*	—	*1*	—	*3*	—
W. District.	Kensington	166,308	—	—	1	—	—	3	—	—	—	—	—	—
	Fulham	91,639	—	—	—	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	1	—	—	—	—	—	—	—	1	—
	Paddington	117,846	—	—	—	—	—	—	—	—	—	—	—	—
	Chelsea	96,253	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—	—	—	—	—
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—	—	—
	Islington	319,143	—	—	—	—	—	—	—	—	—	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	1	—	—	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—	—	—
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	—	—	—	—	1	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	—	—	1	—	—	—	—	—	2	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	1	—	—	—	—	—	—	—	—	—
	Battersea	150,558	—	—	—	—	—	—	1	—	—	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	—	—
	Camberwell	235,344	—	—	—	—	—	—	—	—	—	—	—	—
	Greenwich	165,413	—	—	—	1	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	1	—	—	—
	Plumstead	72,158	—	—	—	—	—	—	—	—	—	—	—	—
	Lee	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

[a] Totals of actual *notifications*.

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SIMPLE CONTINUED FEVER—*continued.*																
Weekly Statement, 1st Quarter, 1894—*continued.*														Totals for 1st Quarter, 1894.		Sanitary Areas.
Feb. 17.		Feb. 24.		Mar. 3.		Mar. 10.		Mar. 17.		Mar. 24.		Mar. 31.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
2	—	—	—	—	—	5	—	1	—	7	—	2	—	28	5	London.
2	—	—	—	—	—	*5*	—	*1*	—	*6*	—	*2*	—	*27*	—	(*Administrative County.*)
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	3	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Fulham.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	3	—	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Marylebone.
—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Pancras.
1	—	—	—	—	—	1	—	1	—	1	—	—	—	4	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
1	—	—	—	—	—	—	—	—	—	1	—	—	—	3	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Mile End Old Town.
—	—	—	—	—	—	2	—	—	—	2	—	—	—	7	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Rotherhithe.
—	—	—	—	—	—	2	—	—	—	2	—	1	—	6	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

Sanitary Areas.		Population (1891).	SIMPLE CONTINUED FEVER—*continued.* Weekly Statement, 2nd Quarter, 1894. April 7.		April 14.		April 21.		April 28.		May 5.		May 12.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London - - - -		4,232,118	[a]1	—	5	—	5	—	3	—	3	—	3	—
(*Administrative County*) -		—	[b]*4*	—	*5*	—	*8*	—	*8*	—	*8*	—	*4*	—
W. District.	Kensington - - -	166,308	—	—	—	—	1	—	—	—	—	—	—	—
	Fulham - - -	91,639	—	—	—	—	—	—	—	—	—	—	—	—
	Hammersmith - -	97,239	—	—	—	—	—	—	—	—	—	—	—	—
	Paddington - - -	117,846	—	—	—	—	—	—	—	—	—	—	—	—
	Chelsea - - -	96,253	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.* -	78,590	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster - -	55,539	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster -	24,995	—	—	—	—	—	—	—	—	1	—	—	—
N. District.	St. Marylebone - -	142,404	—	—	—	—	—	—	—	—	—	—	—	—
	Hampstead - - -	68,416	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras - - -	234,379	—	—	—	—	—	—	—	—	—	—	—	—
	Islington - - -	319,143	—	—	—	—	—	—	—	—	1	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney - - -	198,606	—	—	—	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields -	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand† - - -	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡ - - -	34,043	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell - - -	66,216	—	—	—	—	—	—	—	—	—	—	1	—
	St. Luke, Middlesex -	42,440	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§ - -	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch - - -	124,009	—	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green - -	129,132	—	—	—	—	—	—	—	—	—	—	—	—
	Whitechapel‖ - -	74,420	—	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East -	45,795	—	—	—	—	—	—	—	—	—	—	—	—
	Limehouse - - -	57,376	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town -	107,592	—	—	—	—	—	—	2	—	—	—	—	—
	Poplar - - -	166,748	—	—	—	—	—	—	—	—	—	—	—	—
S. District.	St. Saviour, Southwark -	27,177	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark -	59,712	—	—	—	—	—	—	—	—	—	—	—	—
	Newington - - -	115,804	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark -	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey - -	84,682	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe - -	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth - - -	275,203	1	—	5	—	3	—	1	—	1	—	1	—
	Battersea - - -	150,558	—	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth - -	156,942	—	—	2	—	—	—	—	—	—	—	1	—
	Camberwell - - -	235,344	—	—	—	—	—	—	—	—	—	—	—	—
	Greenwich - - -	165,413	—	—	—	—	1	—	—	—	—	—	—	—
	Lewisham - - -	92,647	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich - - -	40,848	—	—	—	—	—	—	—	—	—	—	—	—
	Plumstead - - -	72,158	—	—	—	—	—	—	—	—	—	—	—	—
	Lee - - - -	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications*.

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

Simple Continued Fever—*continued.*																
Weekly Statement, 2nd Quarter, 1894—*continued.*														Totals for 2nd Quarter, 1894.		Sanitary Areas.
May 19.		May 26.		June 2.		June 9.		June 16.		June 23.		June 30.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1	1	—	1	1	—	5	1	3	—	3	2	2	1	35	6	London.
1	—	—	—	*1*	—	*5*	—	*3*	—	*3*	—	*2*	—	*39*	—	(*Administrative County.*)
—	—	—	—	—	—	1	—	—	—	—	—	—	—	2	—	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Fulham.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	Hammersmith.
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Pancras.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St, Mary, Stoke Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Shoreditch.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George-in-the-East.
—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	2	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Mile End Old Town.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	Rotherhithe.
—	—	—	—	1	—	2	—	2	—	—	—	—	—	15	—	Lambeth.
—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	Battersea.
—	—	—	—	—	—	—	1	—	—	1	1	—	—	4	2	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Greenwich.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 363).

Sanitary Areas.		Population (1891.)	Simple Continued Fever—*continued.*											
			Weekly Statement, 3rd Quarter, 1894.											
			July 7.		July 14.		July 21.		July 28.		Aug. 4.		Aug. 11.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London		4,232,118	[a]3	—	1	—	3	—	4	—	1	—	5	—
(*Administrative County*)		-	[b]*3*	—	—	—	*3*	—	*4*	—	*1*	—	*4*	—
W. District.	Kensington	166,308	—	—	—	—	—	—	—	—	—	—	—	—
	Fulham	91,639	—	—	1	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	—
	Paddington	117,846	—	—	—	—	—	—	—	—	—	—	—	—
	Chelsea	96,253	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	1	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	—	—	—	—	—	—	—	—	2	—
	Hampstead	68,416	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—	—	—
	Islington	319,143	—	—	—	—	—	—	—	—	—	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	—	—	—	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	—	—	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	1	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	1	—	—	—	—	—	—	—
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—	1	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	—	—	—	—	1	—	—	—	—	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	1	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth	275,203	—	—	—	—	—	—	1	—	1	—	—	—
	Battersea	150,558	—	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth	156,942	1	—	—	—	2	—	2	—	—	—	—	—
	Camberwell	235,344	—	—	—	—	—	—	—	—	—	—	1	—
	Greenwich	165,413	—	—	—	—	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—	—	—	—
	Plumstead	73,158	—	—	—	—	—	—	—	—	—	—	—	—
	Lee	16,381	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95).

SIMPLE CONTINUED FEVER—*continued.*

Weekly Statement, 3rd Quarter, 1894—*continued.*														Totals for 3rd Quarter, 1894.		Sanitary Areas.
Aug. 18.		Aug. 25.		Sept. 1.		Sept. 8.		Sept. 15.		Sept. 22.		Sept. 29.				
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
5	—	3	—	5	—	3	1	5	—	6	—	3	—	47	1	London.
5	—	*3*	—	*5*	—	*3*	—	*5*	—	*6*	—	*3*	—	*44*	—	(*Administrative County.*)
—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	Kensington.
—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	1	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Chelsea.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	St. George, Hanover Sq.*
—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. James, Westminster.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Pancras.
—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
1	—	—	—	—	—	1	—	1	—	—	—	—	—	3	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Shoreditch.
—	—	—	—	1	—	—	—	—	—	2	—	1	—	5	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Mile End Old Town.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Bermondsey.
1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Rotherhithe.
1	—	2	—	2	—	1	—	2	—	3	—	1	—	14	—	Lambeth.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	Battersea.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	6	—	Wandsworth.
—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 868).

	Sanitary Areas.	Population (1891).	SIMPLE CONTINUED FEVER—*continued.*													
			Weekly Statement, 4th Quarter, 1894.													
			Oct. 6.		Oct. 13.		Oct. 20.		Oct. 27.		Nov. 3.		Nov. 10.		Nov. 17.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
	London	4,232,118	[a]3	—	6	—	4	—	2	—	6	—	4	1	7	—
	(*Administrative County*)		[b]2	—	*6*	—	*4*	—	*2*	—	*5*	—	*4*	—	*7*	—
W. District.	Kensington	166,308	—	—	1	—	—	—	—	—	—	—	—	—	—	—
	Fulham	91,639	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hammersmith	97,239	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Paddington	117,846	—	—	—	—	—	—	1	—	—	—	—	—	—	—
	Chelsea	96,253	—	—	—	—	1	—	—	—	—	—	—	—	—	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster	55,539	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster	24,995	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone	142,404	—	—	1	—	—	—	—	—	—	—	—	—	1	—
	Hampstead	68,416	—	—	—	—	1	—	—	—	—	—	—	—	—	—
	St. Pancras	234,379	—	—	—	—	—	—	—	—	—	—	1	—	—	—
	Islington	319,143	—	—	—	—	—	—	1	—	1	—	—	—	—	—
	St. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney	198,606	1	—	—	—	1	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields	14,616	—	—	—	—	—	—	—	—	—	—	1	—	—	—
	Strand†	25,217	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡	34,043	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell	66,216	1	—	—	—	—	—	—	—	1	—	—	—	—	—
	St. Luke, Middlesex	42,440	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§	37,583	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch	124,009	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green	129,132	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Whitechapel‖	74,420	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East	45,795	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Limehouse	57,376	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town	107,592	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar	166,748	—	—	1	—	1	—	—	—	1	—	—	1	—	—
S. District.	St. Saviour, Southwark	27,177	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark	59,712	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Newington	115,804	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark	12,723	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey	84,682	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe	39,255	—	—	—	—	—	—	—	—	1	—	1	—	1	—
	Lambeth	275,203	1	—	2	—	—	—	—	—	2	—	—	—	4	—
	Battersea	150,558	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth	156,942	—	—	—	—	—	—	—	—	—	—	—	—	1	—
	Camberwell	235,344	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Greenwich	165,413	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lewisham	92,647	—	—	1	—	—	—	—	—	—	—		—	—	—
	Woolwich	40,848	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Plumstead	72,158	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lee	16,381	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Port of London	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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[a] Totals of actual *notifications.*

[b] Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235).   † Including Middle Temple (population, 95).

SIMPLE CONTINUED FEVER—*continued.*																
Weekly Statement, 4th Quarter, 1894—*continued.*												Totals for 4th Quarter, 1894.		Grand Totals for Year 1894.		Sanitary Areas.
Nov. 24.		Dec. 1.		Dec. 8.		Dec. 15.		Dec. 22.		Dec. 29.						
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
2	—	8	—	4	—	7	—	2	—	5	—	60	1	170	13	London.
2	—	*6*	—	*3*	—	*6*	—	*2*	—	*5*	—	*54*	—	*164*	—	(*Administrative County.*)
—	—	1	—	—	—	1	—	—	—	—	—	3	—	8	3	Kensington.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	2	1	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	Hammersmith.
—	—	—	—	—	—	—	—	1	—	—	—	2	—	3	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	Chelsea.
—	—	—	—	1	—	—	—	—	—	1	—	2	—	4	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Westminster.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	2	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	6	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	Hampstead.
—	—	—	—	—	—	—	—	—	—	1	—	2	—	2	—	St. Pancras.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	8	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
1	—	1	—	—	—	—	—	—	—	—	—	4	—	10	—	Hackney.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	St. Martin-in-the-Fields.
—	—	1	—	—	—	—	—	—	—	—	—	1	—	1	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	2	—	3	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	—	1	—	—	—	—	—	—	—	—	—	1	—	3	—	Shoreditch.
—	—	—	—	1	—	—	—	—	—	—	—	1	—	7	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	1	—	—	—	—	—	—	—	—	—	1	—	4	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	Mile End Old Town.
—	—	—	—	—	—	2	—	—	—	—	—	5	1	13	1	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	Bermondsey.
—	—	—	—	—	—	—	—	—	—	2	—	5	—	7	—	Rotherhithe.
1	—	—	—	1	—	3	—	1	—	—	—	15	—	50	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	Battersea.
—	—	1	—	1	—	—	—	—	—	—	—	3	—	13	2	Wandsworth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Camberwell.
—	—	—	—	—	—	—	—	—	—	1	—	1	—	3	1	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	2	—	3	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96).

‖ Including Tower of London (population, 868).

	Sanitary Areas	Population (1891).	TYPHUS FEVER. Weekly Statement, 1894. Feb. 24. Cases.	Feb. 24. Deaths.	Mar. 10. Cases.	Mar. 31. Cases.	Totals for 1st Quarter, 1894. Cases.	Totals for 1st Quarter, 1894. Deaths.	April 7. Cases.	April 14. Cases.	April 21. Deaths.	May 12. Cases.	May 19. Cases.	June 23. Cases.	June 30. Cases.	Totals for 2nd Quarter, 1894. Cases.	Totals for 2nd Quarter, 1894. Deaths.
	London - - -	4,232,118	a2	1	1	1	4	1	1	1	1	1	1	1	1	6	1
	(*Administrative County*) -	- -	b2	—	*1*	*1*	4	—	*1*	*1*	—	*1*	*1*	*1*	*1*	*6*	—
W. District.	Kensington - -	166,308	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Fulham - - -	91,639	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hammersmith - -	97,239	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Paddington - -	117,846	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Chelsea - - -	96,253	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—
	St. George, Hanover Sq.*	78,599	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Westminster - -	55,539	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. James, Westminster -	24,995	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N. District.	St. Marylebone - -	42,404	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hampstead - -	68,416	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Pancras - -	234,379	—	—	—	—	—	—	—	—	1	—	1	—	—	1	1
	Islington - - -	319,143	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	S. Mary, Stoke Newington	30,936	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Hackney - -	198,606	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Central District.	St. Giles and St. George, Bloomsbury.	39,782	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Martin-in-the-Fields -	14,616	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Strand† - - -	25,217	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Holborn‡ - - -	34,043	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Clerkenwell - -	66,216	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Luke, Middlesex -	42,440	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	London, City of§ - -	37,583	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. District.	Shoreditch - -	124,009	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bethnal Green - -	129,132	—	—	—	—	—	—	—	1	—	—	—	1	—	2	—
	Whitechapel‖ - -	74,420	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George-in-the-East -	45,795	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Limehouse - -	57,376	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Mile End Old Town -	107,592	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Poplar - - -	166,748	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
S. District.	St. Saviour, Southwark -	27,177	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. George, Southwark -	59,712	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Newington - -	115,804	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	St. Olave, Southwark -	12,723	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bermondsey - -	84,682	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Rotherhithe - -	39,255	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lambeth - - -	275,203	—	—	1	—	1	—	1	—	—	—	—	—	1	2	—
	Battersea - - -	150,558	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Wandsworth - -	156,942	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Camberwell - -	235,344	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Greenwich - -	165,413	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Lewisham - - -	92,647	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Woolwich - - -	40,848	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—
	Plumstead - -	72,158	2	—	—	—	2	—	—	—	—	—	—	—	—	—	—
	Lee - - - -	16,381	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—
	Port of London - -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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a Totals of actual *notifications*.

b Totals furnished by the Metropolitan Asylums Board of *actual cases* after correction of returns and deduction of duplicate notifications.

* Including St. Peters, Westminster (population, 235). † Including Middle Temple (population, 95

TYPHUS FEVER—*continued.*

Weekly Statement, 1894—*continued.*

July 7.	July 14.	July 28.		Sept. 15.	Sept. 22.	Totals for 3rd Quarter, 1894.		Oct. 20.	Nov. 3.	Nov. 10.	Nov. 17.	Dec. 22.	Dec. 29.	Totals for 4th Quarter, 1894.		Grand Totals for Year, 1894.		Sanitary Areas.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Cases.	Cases.	Cases.	Ca es.	Cases.	Cases.	Deaths.	Cases.	Deaths.	
1	1	1	1	1	1	3	3	1	3	2	1	1	2	10	—	23	5	London.
1	—	*1*	—	*1*	*1*	*3*	—	*1*	*3*	*1*	*1*	*1*	*1*	*8*	—	*21*	—	(*Administrative County*).
—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	1	—	Kensington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Fulham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hammersmith.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Paddington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Chelsea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Hanover Sq.*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Westminster.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. James, Westminster.
—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	1	—	St. Marylebone.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hampstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	St. Pancras.
—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	Islington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Mary, Stoke Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hackney.
—	—	—	—	—	—	—	—	—	—	2	—	—	—	2	—	2	—	St. Giles and St. George, Bloomsbury.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Martin-in-the-Fields.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strand.†
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Holborn.‡
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Clerkenwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Luke, Middlesex.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	London, City of.§
—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	Shoreditch.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Bethnal Green.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Whitechapel.‖
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George-in-the-East.
—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	Limehouse.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Mile End Old Town.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Poplar.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Saviour, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. George, Southwark.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Newington.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	St. Olave, Southwark.
—	—	—	—	1	1	1	1	—	—	—	—	—	1	1	—	2	1	Bermondsey.
—	—	—	—	—	—	—	—	—	2	—	—	1	—	3	—	3	—	Rotherhithe.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	Lambeth.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Battersea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wandsworth.
1	—	1	1	—	—	2	1	—	—	—	—	—	—	—	—	2	1	Camberwell.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Greenwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lewisham.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	Woolwich.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	Plumstead.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	Lee.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Port of London.

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‡ Including Gray's Inn (population, 253), Lincoln's Inn (population, 27), Charterhouse (population, 136), Staple Inn (population, 21), and Furnival's Inn (population, 121).

§ Including Inner Temple (population, 96). ‖ Including Tower of London (population, 863).

Cholera Experience: England and Wales, 1894; by Dr. Barry.

No. 14.

REPORT on the EXPERIENCE of ENGLAND AND WALES with respect to EPIDEMIC CHOLERA in 1894; by Dr. F. W. BARRY.

(a.) *Cholera detected on Vessels arriving in England "from Foreign" during* 1894.

During 1894, notwithstanding the presence of cholera at numerous Continental ports having trade with this country, only six cases of cholera, or disease suspected to be cholera, were detected on board vessels from foreign. These cases all occurred on two vessels entering the Port of London from St. Petersburg.

On August 7th, the s.s. "Balmore" (19 hands) arrived at the Port of London, having left St. Petersburg on July 31st. On her arrival it was ascertained that one of the crew had been attacked with symptoms suspicious of cholera on August 5th, and had died at sea shortly before the vessel reached the Port of London, and further that there were four cases of suspicious illness on board. The four men suffering from suspicious illness were at once removed to the Port Authority's Hospital, and the corpse was taken to the mortuary at the Port Hospital, where a *post-mortem* examination was made, and a portion of bowel sent to Dr. Klein for bacteriological examination. Dr. Klein reported the result of his examination to be typical of true cholera. Specimens of the dejecta of the four patients admitted to hospital were also submitted to Dr. Klein, who reported that as regards three of the cases the presence of Koch's comma-bacilli was demonstrated, whilst in the fourth case no positive result as to commas was obtained. All four patients ultimately recovered. The vessel was disinfected, and no further cases were reported.

On August 15th the s.s. "Bedford" (21 hands) reached the Port of London, having left St. Petersburg on August 6th. Upon arrival it was ascertained that the steward had sickened on August 12th with characteristic choleraic symptoms. From the history of the case, the Port Medical Officer was of opinion that this man was convalescing from an attack of cholera. He was at once removed to the Port Hospital, where he recovered. The vessel was dealt with in the ordinary way.

In addition to the two vessels named above, which were the only vessels reported to have actually had cholera cases on board on their arrival, a number of vessels reached the ports of this country in 1894, as in the two previous years, on which cases of cholera had occurred during the voyage. In all cases the usual procedure followed at English ports was carried out, the vessel in each instance being sent to the appointed mooring station for disinfection, and all persons on board who, on medical examination, were found to be free from illness suspicious of cholera, allowed to land at once upon furnishing the Port Medical Officer of Health with their names and addresses.

In no case was cholera transmitted from any port to any person resident in the kingdom.

(b.) *Reputed Cholera among English Communities in* 1894.

During the year 1894, only eleven persons residing in nine localities of England and Wales were reported to have been attacked by symptoms of a nature suspicious of cholera. As the clinical symptoms in these eleven cases were in some respects not inconsistent with those of true cholera, specimens of the dejecta were submitted to Dr. Klein for bacteriological examination. He reported that in not a single instance were the appearances found characteristic of cholera, and, further, that all the cultivations gave negative results with respect to the presence of Koch's comma-bacilli.

It is noteworthy that in no sanitary district, port, riparian, or inland, of England and Wales did any death from epidemic cholera occur in 1894.

App. A. No. 15.

On the Progress of the Sanitary Survey (1894); by Dr. Barry.

No. 15.

MEMORANDUM on the PROGRESS of the SANITARY SURVEY made in 1894, in anticipation of CHOLERA; by Dr. F. W. BARRY.

In continuation of the memorandum* published in the last Annual Report of the Medical Officer, I have the honour to submit the following notes with respect to the progress of the systematic Sanitary Survey which was continued throughout the year 1894 under my general supervision.

Several of the Port Sanitary Districts inspected during 1893 were re-inspected in 1894, and 21 Urban and 9 Rural Sanitary Districts were inspected during 1894 as to the exercise of their functions respecting shipping. Lists of these districts, the inspection of which was entrusted to Dr. Bruce Low, Dr. Reece, and Dr. Wheaton, will be found in the following Table I.

TABLE I.

RIPARIAN SANITARY DISTRICTS of ENGLAND and WALES inspected during 1894 as to the exercise of their FUNCTIONS respecting SHIPPING.

(*a.*) *Urban Districts.*

Name of Sanitary District.	Inspector.	Name of Sanitary District.	Inspector.
1. Bridport - -	Dr. Reece.	12. Pwllheli - -	Dr. Reece.
2. Eccles - - -	Dr. Bruce Low.	13. Ramsgate -	Dr. Bruce Low.
3. Hastings - -	„	14. Runcorn - -	„
4. Herne Bay -	„	15. St. Ives - -	Dr. Wheaton.
5. Hythe - -	„	16. Salford - -	Dr. Bruce Low.
6. Irlam - - -	„	17. Seaton - -	Dr. Reece.
7. Lymm - -	„	18. Sidmouth - -	„
8. Manchester - -	„	19. Stretford -	Dr. Bruce Low.
9. Margate - -	„	20. Warrington -	„
10. New Quay - -	„	21. Widnes - -	„
11. Paignton - -	„		

(*b.*) *Rural Districts.*

1. Altrincham - -	Dr. Bruce Low.	6. Narberth - -	Dr. Reece.
2. Barton-upon-Irwell	„	7. Runcorn - -	Dr. Bruce Low.
3. Carmarthen - -	Dr. Reece.	8. Warrington - -	„
4. Chester - -	Dr. Bruce Low.	9. Widnes - -	„
5. Hastings - -	„		

The results, in detail, of the inspection of the whole coast line visited in connexion with the survey during 1893–94 have already been published in a separate volume.†

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* Supplement to the Twenty-Third Annual Report of the Local Government Board, 1893–94, pp. 437–441.

† Reports and Papers on the Port and Riparian Sanitary Survey of England and Wales, 1893–94; with an Introduction by the Medical Officer of the Local Government Board. 1895. [C.—7812.]

App. A. No. 15.
On the Progress of the Sanitary Survey (1894); by Dr. Barry.

In addition to the inspection with respect to their port functions of the districts enumerated in Table I., 132 Urban and 30 Rural Sanitary Districts were visited during 1894 in connexion with the General Cholera Survey. Lists of these districts will be found in Tables II. and III. respectively.

In each instance a complete record of the sanitary circumstances and of the sanitary administration of the district was obtained. This Cholera Survey work was, under my supervision, carried out by Dr. Bruce Low, Dr. Sweeting, Mr. T. W. Thompson, Dr. Theodore Thomson, Dr. Fletcher, Dr. Bulstrode and Dr. Reece of the permanent, and by Dr. Wheaton and Dr. Wilson of the temporary staff of the department.

A detailed précis of the results of these inspections is now in preparation and will appear in a separate volume.

TABLE II.

URBAN SANITARY DISTRICTS of ENGLAND and WALES inspected during 1894 as regards their SANITARY CIRCUMSTANCES and ADMINISTRATION :—

Name of Sanitary District.	Population (Census 1891).	County.	Inspector.
1. Alfreton	15,355	Derbyshire	Dr. Wilson.
2. Alvaston and Boulton	3,116	"	"
3. Audley	12,631	Staffordshire	Dr. Fletcher.
4. Banbury	12,768	Oxfordshire	Dr. Wheaton.
5. Barnstaple	13,058	Devonshire	Dr. Reece.
6. Baslow and Bubnell	864	Derbyshire	Dr. Wilson.
7. Belper	10,420	"	"
8. Bideford	7,831	Devonshire	Dr. Reece.
9. Bingley	9,261	Yorkshire	Dr. Wheaton.
10. Bingley Outer	10,023	"	"
11. Bridlington	8,916	"	"
12. Bridport	6,611	Dorsetshire	Dr. Reece.
13. Broadstairs and St. Peter.	5,234	Kent	Dr. Bruce Low.
14. Budleigh Salterton	1,770	Devonshire	Dr. Reece.
15. Burslem	31,999	Staffordshire	Dr. Fletcher.
16. Calne	3,495	Wiltshire	Dr. Wilson.
17. Calverley	2,525	Yorkshire	"
18. Camborne	14,700	Cornwall	Dr. Reece.
19. Carlisle	39,176	Cumberland	Dr. Wilson.
20. Chepstow	3,378	Monmouthshire	Dr. Reece.
21. Chesterfield	22,009	Derbyshire	Dr. Wilson.
22. Clay Cross	7,727	"	"
23. Clayton	4,707	Yorkshire	"
24. Cleckheaton	11,826	"	"
25. Cockermouth	5,464	Cumberland	"
26. Coseley	21,899	Staffordshire	Dr. Fletcher.
27. Darlaston	14,422	"	"
28. Dawlish	4,210	Devonshire	Dr. Reece.
29. Doncaster	25,933	Yorkshire	Dr. Wheaton.
30. Drighlington	4,322	"	Dr. Wilson.
31. Dronfield	3,438	Derbyshire	"
32. Dudley	45,740	Worcestershire	Dr. Fletcher.
33. Durham	14,863	Durham	Dr. Wheaton.
34. East Retford	10,603	Nottinghamshire	"
35. Eccles	29,633	Lancashire	Dr. Bruce Low.
36. Eccleshill	7,928	Yorkshire	Dr. Wilson.
37. Ely	8,017	Cambridgeshire	Dr. Wheaton.
38. Faversham	10,478	Kent	Dr. Theodore Thomson.

Table II.—*continued.*

Name of Sanitary District.	Population (Census 1891).	County.	Inspector.
39. Fenton	16,998	Staffordshire	Dr. Sweeting.
40. Gildersome	3,175	Yorkshire	Dr. Wheaton.
41. Hanley	54,946	Staffordshire	Dr. Fletcher.
42. Harwich	8,202	Essex	Dr. Wheaton.
43. Hastings	52,223	Sussex	Dr. Bruce Low.
44. Havant	3,474	Hampshire	Dr. Theodore Thomson.
45. Heage	2,490	Derbyshire	Dr. Wilson.
46. Heanor	9,779	,,	,,
47. Heath Town	7,075	Staffordshire	Dr. Fletcher.
48. Herne Bay	3,825	Kent	Dr. Bruce Low.
49. Holbeach	4,771	Lincolnshire	Dr. Wheaton.
50. Hornsea	2,013	Yorkshire	,,
51. Howdon-on-Tyne	962	Northumberland	Dr. Fletcher.
52. Hoyland Nether	11,006	Yorkshire	Dr. Wheaton.
53. Hunsworth	1,400	,,	,,
54. Huntingdon	4,346	Huntingdonshire	,,
55. Hythe	4,347	Kent	Dr. Bruce Low.
56. Idle	7,118	Yorkshire	Dr. Wilson.
57. Ilfracombe	7,692	Devonshire	Dr. Reece.
58. Ipswich	57,360	Suffolk	Dr. Wheaton.
52. Keighley	30,810	Yorkshire	,,
60. Kendal	14,430	Westmorland	Dr. Fletcher.
61. Knaresborough	4,649	Yorkshire	Dr. Wheaton.
62. Knottingly	5,425	,,	Dr. Wilson.
63. Levenshulme	5,506	Lancashire	Dr. Bruce Low.
64. Lincoln	41,491	Lincolnshire	Dr. Wheaton.
65. Llandudno	7,348	Carnarvonshire	Dr. Reece.
66. Long Sutton	2,439	Lincolnshire	Dr. Wheaton.
67. Longton	34,327	Staffordshire	Dr. Sweeting.
68. Lower Brixham	6,224	Devonshire	Dr. Wheaton.
69. Ludlow	4,460	Shropshire	Dr. Bruce Low.
70. Lydd	2,051	Kent	,,
71. Lyme Regis	2,365	Dorsetshire	Dr. Reece.
72. Margate	18,417	Kent	Dr. Bruce Low.
73. Maryport	8,784	Cumberland	Dr. Wilson.
74. Millom	8,895	,,	,,
75. Milton-next-Sittingbourne.	5,213	Kent	Dr. Theodore Thomson.
76. Morley	21,068	Yorkshire	Dr. Wheaton.
77. Morpeth	5,219	Northumberland	Dr. Wilson.
78. Newbold and Dunston	5,192	Derbyshire	,,
79. Newburn	7,963	Northumberland	,,
80. Newcastle-under-Lyme	18,452	Staffordshire	Dr. Sweeting.
81. New Quay	1,891	Cornwall	Dr. Reece.
82. New Romney	1,366	Kent	Dr. Bruce Low.
83. Northam	5,043	Devonshire	Dr. Reece.
84. North Bierley	22,178	Yorkshire	Dr. Wheaton.
85. Oldbury	20,370	Worcestershire	Dr. Fletcher.
86. Ormskirk	6,298	Lancashire	Dr. Bruce Low.
87. Paignton	6,783	Devonshire	Dr. Wheaton.
88. Pemberton	18,400	Lancashire	Dr. Bruce Low.
89. Pembroke	14,978	Pembrokeshire	Dr. Reece.
90. Penrith	8,981	Cumberland	Dr. Bruce Low.
89. Pudsey	13,444	Yorkshire	Dr. Horne.
92. Pwllheli	3,231	Carnarvonshire	Dr. Reece.
93. Ramsey	4,684	Huntingdonshire	Dr. Wheaton.
94. Ramsgate	24,733	Kent	Dr. Bruce Low.
95. Ripley	6,813	Derbyshire	Dr. Wilson.
96. Runcorn	20,050	Cheshire	Dr. Bruce Low.
97. Rye	3,871	Sussex	,,

Table II.—*continued.*

Name of Sanitary District.	Population (Census 1891).	County.	Inspector.
98. St. Ives - - -	6,094	Cornwall - -	Dr. Wheaton.
99. St. Neots - - -	4,077	Huntingdonshire	„
100. Salford - -	198,139	Lancashire -	Dr. Bruce Low.
101. Sandgate - -	1,756	Kent - -	„
102. Seaton - -	1,293	Devonshire -	Dr. Reece.
103. Shipley - -	23,387	Yorkshire -	Dr. Wilson.
104. Shrewsbury - -	26,967	Shropshire - -	Dr. Bruce Low.
105. Sidmouth - - -	3,758	Devonshire - -	Dr. Reece.
106. Sittingbourne -	8,302	Kent - -	Dr. Theodore Thomson.
107. Smallthorne - -	5,279	Staffordshire -	Dr. Fletcher.
108. Southend-on-Sea -	12,333	Essex - - -	Dr. Theodore Thomson.
109. South Shields -	78,391	Durham - -	Mr. T. W. Thompson.
110. Spalding - -	9,014	Lincolnshire -	Dr. Wheaton.
111. Stoke-upon-Trent -	24,027	Staffordshire -	Dr. Sweeting.
112. Stretford - - -	21,751	Lancashire -	Dr. Bruce Low.
113. Sunderland - -	131,015	Durham - -	Mr. T. W. Thompson.
114. Swadlincote - -	3,743	Derbyshire - -	Dr. Wilson.
115. Thornton - -	5,680	Yorkshire - -	„
116. Tipton - - - -	29,314	Staffordshire -	Dr. Fletcher.
117. Tong - - -	6,899	Yorkshire - -	Dr. Wilson.
118. Truro - - -	11,131	Cornwall - -	Dr. Fletcher.
119. Tunstall - -	15,730	Staffordshire -	„
120. Tynemouth - -	46,588	Northumberland	Dr. Wheaton.
121. Walker - -	11,341	„	Dr. Fletcher.
122. Wallsend - -	11,257	„	„
123. Wallsall - -	71,789	Staffordshire -	„
124. Warblington - -	2,840	Hampshire - -	Dr. Theodore Thomson.
125. Warrington - -	52,743	Lancashire -	Dr. Bruce Low.
126. Wednesbury - -	25,347	Staffordshire -	Dr. Fletcher.
127. Whitley and Monkseaton.	3,008	Northumberland	„
128. Widnes - -	30,011	Lancashire -	Dr. Bruce Low.
129. Wigan - - -	55,013	„	„
130. Willington Quay -	6,383	Northumberland	Dr. Fletcher.
131. Wilsden - -	2,764	Yorkshire -	Dr. Wilson.
132. Workington - -	23,490	Cumberland -	„

Table III.

Rural Sanitary Districts of England and Wales inspected during 1894, as regards their Sanitary Circumstances and Administration.

Name of Sanitary District.	Population (Census, 1891).	County.	Inspector.
1. Axbridge - -	24,965	Somerset -	Dr. Wheaton.
2. Barnstaple - -	19,071	Devonshire -	Dr. Reece.
3. Barton-upon-Irwell -	26,832	Lancashire -	Dr. Bruce Low.
4. Bideford - - -	7,322	Devonshire -	Dr. Reece.
5. Bodmin - -	11,664	Cornwall - -	Dr. Wheaton.
6. Calne - - -	5,014	Wiltshire -	Dr. Wilson.

App. A. No. 15.

On the Progress of the Sanitary Survey (1894); by Dr. Barry.

Table III.—*continued.*

Name of Sanitary District.	Population (Census 1891).	County.	Inspector.
7. Cheadle	22,302	Staffordshire	Dr. Fletcher.
8. Chesterfield	59,192	Derbyshire	Dr. Wilson.
9. Cosford	12,369	Suffolk	Dr. Fletcher.
10. Crickhowell	7,464	Brecknockshire	Dr. Wilson.
11. Docking	16,030	Norfolk	Dr. Wheaton.
12. Doncaster	28,364	Yorkshire	„
13. Downham	15,840	Norfolk	„
14. Durham	32,686	Durham	Dr. Wilson.
15. Hastings	11,243	Sussex	Dr. Bruce Low.
16. Hemsworth	14,631	Yorkshire	Dr. Wilson.
17. Holbeach	8,599	Lincolnshire	„
18. Kendal	21,606	Westmorland	Dr. Fletcher.
19. Ludlow	13,196	Shropshire	Dr. Bruce Low.
20. Mansfield	21,500	Derbyshire	Dr. Wilson.
21. Newcastle-under-Lyme	6,174	Staffordshire	Dr. Fletcher.
22. Rochford	17,938	Essex	Dr. Wheaton.
23. Rothbury	6,083	Northumberland	Dr. Fletcher.
24. Runcorn	22,467	Cheshire	Dr. Bruce Low.
25. Spalding	12,719	Lincolnshire	Dr. Wilson.
26. Stone	13,872	Staffordshire	Dr. Fletcher.
27. Sunderland	17,552	Durham	Mr. T. W. Thompson.
28. Thanet, Isle of	9,466	Kent	Dr. Bruce Low.
29. Warrington	12,783	Lancashire	„
30. Wolstanton and Burslem	32,387	Staffordshire	Dr. Fletcher.

No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

REPORT on the WESTERN DIFFUSION of CHOLERA during the Year 1893; by Dr. F. W. BARRY.

IN continuation of my Reports on the Western Diffusion of Cholera during the year 1892,[*] and on Cholera in Germany during the winter of 1892–93,[†] published in the two last Annual Reports, I have the honour to submit the following account of the progress of the disease in 1893.

In the first instance I propose to give a short summary of the prevalence of cholera during 1893, and afterwards to deal with the history of the disease in the several countries invaded.

At the commencement of 1893 cholera was still persisting in Russia in Europe, in the western Provinces of Bessarabia, Podolia, Kief, and Volhynia; in France in the western Departments of Morbihan and Loire Inférieure, and in the northern Department of Pas-de-Calais; there were also a few cases recorded in Germany and Austro-Hungary. In Western Asia cholera was still prevalent in Persia, and in the Province of Yemen in Arabia; its continuance in the last-named country having very far-reaching consequences, affecting, as it did, the Mecca pilgrims. In Arabia the disease was in a large number of instances carried from place to place by soldiers on the march, and to this its communication to the pilgrims at Mecca is said to have been due, the first recognised case of cholera there on June 8th having been that of a soldier from Yemen. From Mecca cholera was carried to Jeddah, Asia Minor, Turkey in Europe, Tripoli, and Morocco. In Persia cholera prevailed throughout the year, and an outbreak in Mesopotamia, which commenced in May, is probably to be traced to the epidemic in Persia.

With the advent of hot weather, cholera became more widely diffused in Russia, but in 1893, unlike the previous year, the western Provinces suffered the most. In France, in the early months of 1893, cholera was practically confined to Brittany and to the districts near Marseilles, as well as Marseilles itself. Later in the year considerable extension took place in the west, whilst in the south the disease was widespread in that part of the country which lies between the Pyrenees and the Alps.

In March cholera was introduced into Italy from France, and certain outbreaks in Germany were also traced to the same source. In June cholera appeared amongst railway workmen in Hungary—spreading rapidly throughout that country in July, and extending to Austria and Bosnia. In June also, England, which had escaped the previous year, became affected, although but to a very slight extent. Roumania and Spain, which had both remained free during 1892, were invaded in 1893, and in both these countries the disease caused considerable mortality.

Recrudescences of cholera occurred in Belgium and Holland, and outbreaks were also recorded in Tunis and Algeria in North Africa, and in Senegal in West Africa. Cases were also conveyed by ship to the United States, to Brazil, and also to the Canary Islands, where it occasioned a serious epidemic.

In Table I. a summary is given of the number of deaths and of cases occurring in the several countries affected, together with the dates of the first-recorded attack in 1893, so far as they can be gleaned from published statistics.

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[*] Report on the Origin and Progress of the Western Diffusion of Cholera during the year 1892. Supplement to the 22nd Annual Report of the Local Government Board, 1892–93, pp. 117–236.

[†] Report on Cholera in Germany during the Winter of 1892–93. Supplement to the 23rd Annual Report of the Local Government Board, 1893–94, pp. 425–436.

TABLE I.

Statistics of Cholera recorded in 1893 in the several Countries invaded situate West of India.

Country.	Population.		Date of first recorded Attack of Cholera, 1893.	Total recorded Cholera.	
	Number.	Date of Census.		Attacks.	Deaths.
Arabia	6,000,000	estimated	January	?	50,000 (about)
Persia	7,500,000	estimated	„	?	70,000 (about)
Russia in Europe	95,990,175	1886	„	99,550	41,047
France	38,343,192	1891	„	?	4,000 (about)
Caucasus	7,284,547	1885	March 8	965	1,203
Central Asiatic, Russia and Siberia.	9,640,778	1885	„ 10	781	349
Italy	30,158,408	1890	„ 10	5,731	3,036
Mesopotamia	1,050,000	estimated	May 17	?	4,320
Germany	49,428,470	1890	„ 27	567	298
Hungary	17,463,789	1890	June 24	6,753	3,773
England and Wales	29,002,525	1891	„ 25	300	139
Asia Minor	11,262,044	estimated	„ ?	?	1,000 (about)
Senegal	221,000	estimated	July 1	?	1,154
Belgium	6,069,321	1890	„ 3	615	372
Algeria	4,124,732	1893	„ ?	?	1,000 (about)
Tunis	1,500,000	estimated	„ 12	?	500 (about)
Netherlands	4,511,415	1889	„ 13	?	376
Roumania	5,038,342	1889–90	„ 19	1,494	872
Austria	23,748,092	1890	August 3	1,528	896
United States	62,622,250	1892	„ 3	33	13
Egypt (El Tor)	1,511	1893	„ 3	24	?
Brazil	14,000,000	estimated	„ 12	?	22
Tripoli	1,010,000	estimated	„ 15	?	37
Turkey-in-Europe	4,688,000	estimated	„ 18	?	1,500 (about)
Morocco	8,000,000	estimated	„ 22	52	15
Scotland	4,025,647	1891	„ 26	1	1
Spain	17,565,632	1887	September 4	1,149	490
Servia	2,161,962	1890	„ 9	4	3
Bosnia	1,454,365	1892	„ 22	1,015	512
Sweden	4,784,981	1890	„ 27	5	1
Canary Islands	291,625	1887	October 2	2,000 (about)	411
Bulgaria	3,305,458	1890	„ 12	12	8

In the following account of the diffusion of cholera in the several countries invaded during 1893, further records will be found of observations tending to show the important part played by water in the dissemination of the disease.

OTTOMAN EMPIRE.

In 1893, as in 1892, there were two independent diffusions of cholera in the Ottoman Empire :—the one, a continuation of the epidemic which had prevailed in Arabia during 1890, 1891, and 1892; the other, affecting Mesopotamia and apparently confined to that province.

I propose to deal in the first instance with the diffusion of cholera in Arabia, and its spread from thence by means of pilgrims returning from Mecca to other provinces of Turkey in Asia and Europe, and to give, secondly, a short account of the diffusion of the disease in Mesopotamia.

(a.) *Arabia, Asia Minor, and Turkey in Europe.*

As stated in my Report for 1892,* cholera became epidemic in Yemen in Arabia in April 1892, and prevailed in that province throughout the year. The disease was particularly fatal to Turkish soldiers employed in military operations in Yemen in the summer of that year, and, as noted in the Report referred to, these men were sent to their homes in detachments during the autumn and winter months. Before their departure for Asia Minor, the soldiers were required to undergo quarantine at the Island of Kamaran, and whilst they were there, the sanitary authorities discovered not only many cases of cholera amongst the men, but also found hidden on board one of the transports—the "Sogütlü" 335 bundles of old clothing which had belonged to soldiers who had died of cholera, and which were being returned to their families in Asia Minor. Such bundles as were discovered were destroyed at Kamaran, but the sanitary authorities regard it as probable that many similar bundles escaped their notice. Amongst the military who underwent quarantine at Kamaran during the months of January and February 1893, cholera cases continued to occur. On January 17th the first pilgrim ship from Soerabaja arrived with 264 pilgrims. It left Kamaran again on January 22nd, and was, throughout its journey, reported to have been free from cholera. The last transport left Kamaran on February 10th, having no cases on board. From this date until the end of May the pilgrim ships from the East arrived at Kamaran at short intervals, and landed there in all 31,788 pilgrims, of whom 14,291 came from India.

Of 87 English steamers which underwent quarantine at the island, on one, the "Sultan," there was a single case of suspicious diarrhœa only; on another, the "Knight of St. John," which arrived from Bombay on May 7th with 1,050 pilgrims on board, it was reported that five deaths from ordinary sicknesses had taken place during the voyage. On May 10th, and succeeding days, cases of cholera appeared amongst the pilgrims on this ship. She was detained at Kamaran for several weeks, and on her arrival at Jeddah cholera had already broken out at Mecca.

On May 5th the authorities of the provinces on the East African and South Arabian littorals reported that the public health was good. On May 17th the Governor of Yemen telegraphed to the effect that that province had been free from cholera for forty days, a statement which was subsequently found to have been incorrect. On June 8th, cholera was recognised as having broken out amongst the pilgrims at Mecca, the first to be attacked being persons from Yemen. According to Dr. Karlinski, the first cases occurred amongst soldiers who had been sent from Yemen to the Hedjaz.

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* Supplement to the 22nd Annual Report of the Local Government Board, 1892-93 [C.—7412.], p. 207.

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Before considering the course of the epidemic at Mecca, it will be necessary to refer in some little detail to the previous history of cholera in Yemen itself, as ascertained by Dr. Kassim Jzzeddin, the sanitary officer at Mecca. From his investigations it appears that one group of pilgrims from Yemen left Hodeidah on May 31st, underwent a "quarantine of observation" of 24 hours at Kamaran, and, after a stay of four days at Jeddah. reached Mecca three days before the outbreak of cholera on June 8th, Another group came from Hodeidah, on the Turkish ship "Muruwet," to Jeddah, and during the voyage two of the pilgrims died from watery diarrhœa, their deaths being concealed at Jeddah. These pilgrims came from the district of Djebel Djafi, 12 days journey from Hodeidah, from the villages of Katala Elbaïda, Kaïfaä, Elmussita, and also from Houdjarié and Ouissab, villages situate from one to two days' journey from Hodeidah. These pilgrims, and their leader, stated that in a village of 300 inhabitants, situate in Djebel Djafi 60 persons had died from cholera shortly before the departure of the pilgrims; that cholera was raging in Ouissab, and also in Beïma and Eloudïn (five days from Hodeidah); in the district of the Djebel Bura (one day from Hodeidah), and in Muraouia, Hair, and Taaz. It was also ascertained that cholera was prevalent in the neighbourhood of Sana'a, the chief town of Yemen. The above information was only elicited with considerable difficulty.

As already stated, the first case of cholera was recognised on June 8th at Mecca, where it rapidly assumed epidemic proportions. The outbreak of cholera at Mecca in 1893 was the more serious on account of the presence of an exceptional number of pilgrims, this being due to the fact that the special day for the pilgrimage to Mouna fell on a Friday, which had not happened for many years, and that presence at the ceremonies on this occasion conferred the privilege of a Hadji, not only upon the pilgrim himself, but also upon his nearest relations. Many estimates of the number of persons attending this pilgrimage have been made, and all agree as to the exceptionally large number who were present. According to Dr. Mordtmann[*] there were, in the caravans from Yemen, 16,000, from Bagdad, 22,000, from Syria, 3,000, from Medina, 6,000; and by sea, by way of Jeddah, 94,963, or roundly in all 142,000; and to this number must be added 200,000 from the Hedjaz, and as well the ordinary inhabitants of Mecca, or in all about 400,000. When cholera did break out in Mecca it spread with such enormous rapidity that the officials were utterly unable to cope with it, and it has been impossible to obtain any reliable statistics of the mortality. In the following Table II. the official statistics of the epidemic are given, and it will be observed that on two or three days no attempt was made even to estimate the number of deaths, the largest number on any one day recorded in the official statistics being on June 26th, the day of the return of the pilgrims from Mouna to Mecca, when 999 deaths were recorded. According to Dr. Chaffy, who was sent by the Egyptian government to Mecca, the deaths on certain of the days were from 2,500 to 3,000. He reported that in consequence of the enormous mortality the number of deaths could not be ascertained, and that they must certainly have been at least double those given in the official returns. At Mouna it was impossible to bury the dead, and corpses were piled up in heaps in several places. The road from Mouna to Mecca was strewn with corpses, whilst in the town of Mecca itself bodies were lying in a state of putrefaction to such an extent as to render it impossible to walk through the town, and when the authorities did succeed in getting the bodies transported to the cemetery they had still to be left for two or three days without burial, for lack of gravediggers.

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[*] Die Cholera in der Türki und Konstantinopel im Jahre 1893, von Dr. Mordtmann, Kais-deutscher Delegirter zum Conseil Sanitaire in Konstantinopel. Hygienischen Rundschau, 1894, Nos. 7 and 8.

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TABLE II.

Showing the Number of Deaths from Cholera officially recorded as having taken place amongst the Pilgrims at Mecca and Mouna during Six Weeks ended July 19th, 1893.

Day of Month.	Deaths from Cholera recorded.	Week ending	Deaths from Cholera recorded.	Day of Month.	Deaths from Cholera recorded.	Week ending	Deaths from Cholera recorded.
June 8	31	June 14	389	June 29	511	July 5	2,316
„ 9	46			„ 30	443		
„ 10	46			July 1	452		
„ 11	51			„ 2	294		
„ 12	58			„ 3	257		
„ 13	87			„ 4	214		
„ 14	70			„ 5	145		
„ 15	75	„ 21	1,035	„ 6	131	„ 12	680
„ 16	85			„ 7	136		
„ 17	120			„ 8	110		
„ 18	124			„ 9	121		
„ 19	179			„ 10	61		
„ 20	231			„ 11	81		
„ 21	221			„ 12	40		
„ 22	102	„ 28	3,383*	„ 13	34	„ 19	132
„ 23	?			„ 14	26		
„ 24	*220*			„ 15	21		
„ 25	*455*			„ 16	20		
„ 26	*499* 500			„ 17	15		
„ 27	955			„ 18	11		
„ 28	652			„ 19	5		
						Total -	7,935

* [The figures in *italics* represent the number of deaths officially recorded to have taken place at Mouna. On July 23rd there was no record of the mortality at either Mouna or Mecca, and on July 24th and July 25th there was no record of the mortality at Mecca.]

The incompleteness of these official figures is shown by the fact that the Chief Shereef of Mecca estimated the mortality from June 8th to June 19th at 50,000. On June 26th, after the religious festivals of Arafat and Mouna, the return journey was begun. The pilgrims, contrary to their usual custom, instead of staying for some eight or ten days, at the holy places, fled panic-stricken to Mecca and thence to Jeddah. On reaching the latter place they swarmed on board the ships already lying prepared for them, and such was the disorder that the usual regulations could not be carried out by the small sanitary staff stationed at Jeddah. Several vessels before leaving the port had from twenty to thirty deaths from cholera on board, and corpses were even thrown into the sea from boats conveying pilgrims to the ships. On June 28th the first returning pilgrims reached Jeddah, and on that day the first case of cholera there was notified. From that date a continuous stream of pilgrims poured into the town and within eight days 60,000 had arrived. To deal with this mass of pilgrims there were two doctors only, and Dr. Karlinski who was in charge of the Bosnian-Herzegovinian pilgrims has

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given a graphic account of the state of affairs at Jeddah and of the road thence from Mecca. In Table III. the official figures as to the mortality from cholera in the hospitals at Jeddah are given, together with the numbers of deaths which were estimated by the Austrian Consul, as having taken place in the town, and quoted from the paper by Dr. Karlinski referred to above.*

TABLE III.

CHOLERA at JEDDAH during 22 Days ended July 19th 1893.

Date.	Deaths from Cholera recorded as having occurred in the Hospitals.	Estimated Number of Deaths which occurred from Day to Day in the Town of Jeddah apart from the Hospitals.
June 28	5	—
„ 29	40	?
„ 30	50	?
July 1	80	?
„ 2	134	434
„ 3	257	486
„ 4	214	406
„ 5	145	255
„ 6	131	220
„ 7	136	181
„ 8	110	136
„ 9	121	117
„ 10	86	120
„ 11	66	131
„ 12	86	100
„ 13	18	87
„ 14	21	80
„ 15	8	65
„ 16	21	—
„ 17	22	—
„ 18	12	—
„ 19	—	—
	1,713	2,818
	4,531	

From June 28th to July 18th, when the last pilgrim ship left Jeddah, it was estimated that there had been 2,400 deaths amongst the pilgrims in that town, in addition to a large number of the inhabitants who had also succumbed to the disease.

As was to be expected frequent cases of cholera occurred amongst the pilgrims on shipboard, and the disease was carried to distant countries. The following may be taken as a typical example of what happened on the return journey. On July 9th the English steamship "Etna" (826 tons), having 1,393 Yemen pilgrims on board, arrived at Kamaran from Jeddah. This vessel had no doctor on board, and on her arrival at Kamaran had no drinking water. During the voyage fifty corpses had been thrown overboard, and of the crew seven stokers had died. On her arrival at Kamaran, 20 persons were found to be suffering from cholera. The pilgrims were landed and isolated in groups, and during the first five days 35 cases and 25 deaths occurred. After that there were no further cases, and ten days later the pilgrims, after disinfection were allowed to resume their voyage. It is impossible to give any accurate statement as to the deaths which occurred on the return journey either by sea or by land, but the following estimate has been made by Dr. Cassim Jzzeddin, of the number of deaths amongst the pilgrims returning by land:—

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* Unter der Gelben Flagge. Errinerungen und Eindrücke von meiner Reise nach Arabien und Kleinasien, Von Dr. Justyn Karlinski. Hygienischen Rundschau. 1894.

Caravans of Yemen - - - - -	6,000
Bedouins of the Hedjaz - - -	1,000
Caravans of Bagdad - - - - -	3,000
Caravans of Syria - - - - - -	400
On the road between Mecca and Medina - -	2,000
„ „ „ Jeddah -	4,000
	14,400

It will now be necessary to follow those pilgrims who returned by way of the Suez Canal, who all, with the exception of those conveyed by certain vessels which passed through the Suez Canal in quarantine, had to undergo a quarantine of fourteen days at El Tor. In all 29,310 pilgrims were received in 1893 at El Tor, where, as the steam disinfecting apparatus was out of order, the disinfection of their effects was only nominal, and where, further, the pumping out of the bilges was not enforced. Nearly all the pilgrim ships left one or more cases of cholera in the lazaretto there. The following is a list of the ships which arrived at El Tor with pilgrims bound for Turkish harbours of the Mediterranean and the Black Sea.

Name of Vessel.	No. of Pilgrims.	Date of		Number of Cholera		Date of last case of Cholera.
		Arrival.	Departure.	Cases.	Deaths.	
"Sögütlü" - -	850	July 5th -	Aug. 3rd -	55	41	July 18th.
"Muruwet" - -	910	„ „ -	July 22nd -	11	8	„ „
"Abdel Kader" -	1,335	„ 8th -	Aug. 8th -	44	33	„ 19th.
"Saadet" - -	930	„ 9th -	July 30th -	1	1	„ 15th.
"Nimet Huda" -	990	„ 13th -	Aug. 1st -	3	3	„ 17th.
"Bahrgedid" -	880	„ 22nd -	„ 12th -	—	—	—
"Etna" - - -	981	Passed through the Canal in quarantine on August 18th.				
"Selanik" - -	500	Aug. 21st -	Sept. 4th -	—	—	—
"Afghan" - -	756	Passed through the Canal in quarantine on August 7th.				

In addition to the deaths from cholera the ships collectively lost at El Tor 375 pilgrims from dysentery and exhaustion, and all left the place with an unusual number of sick persons on board, whose illness was regarded as due to the bad and brackish drinking water.

The pilgrim ship "Afghan" which passed through the canal in quarantine, arrived at Tripoli on August 11th, after having had 40 deaths from cholera on board, and landed several cholera sick at Tripoli.

The "Etna," which like the "Afghan" passed through the canal in quarantine and which, as has been stated, had already taken a load of pilgrims to Kamaran, had subsequently to passing through the canal several cases of cholera on board, and landed some at Mogador in Morocco.

The "Abdel Kader," which had had 120 deaths from dysentery at El Tor, was distinguished at all the stations along its route by its especially insanitary condition, which is stated to have been almost as bad as that of a slaver. This vessel arrived at Beyrout on August 10th, and between El Tor and Beyrout had had 36 deaths from dysentery. On the 23rd of August a man died on board from cholera, and between that date and September 8th there were eight further deaths from cholera amongst her pilgrims. The vessel was not relieved from quarantine at Beyrout until September 25th. The "Selanik" arrived at Beyrout on September 10th, having had one death from cholera on the voyage.

It is to be observed that at the beginning of August, prior to the arrival of these vessels at Beyrout, the "Adana" had reached that port with 800 invalided soldiers from the province of Yemen; that at a later date this vessel was engaged in the transportation of soldiers to towns situate on the coast of the Black Sea; and that everywhere cases of cholera followed its arrival.

The pilgrims for Constantinople had to pass through the quarantine station at Klazomene (Smyrna) where their effects were disinfected and where the bilge water of the vessels was pumped out. On August 20th the "Nimet Huda," the first of the pilgrim ships for Constantinople, arrived there with 604 pilgrims. On August 21st she was followed by the "Sögütlü" (407 pilgrims), and on August 23rd by the "Saadet" (22 pilgrims). The last ships to arrive were the "Selanik" and the "Abdel Kader" on October 2nd. After they had landed pilgrims at the Golden Horn, they continued their journey to their final destination at Rize in the Black Sea.

It is to be observed that the appearance of cholera had been officially recognised at Smyrna in the beginning of June, but there is reason to believe that it was actually present there at a much earlier date. Dr. Mordtmann lays especial stress on the fact that a large number of invalided soldiers belonging to the provinces of Smyrna and of Aidin had returned home from Yemen during the winter of 1892–93 and the spring of 1893, and that these men had, without doubt, brought home, in many instances, the infected property of their dead comrades which had escaped the notice of the overworked officials at Kamaran and Klasomene. Up to October 31st 1893, there were said to have been 543 cases of cholera at Smyrna, and of these 405 had proved fatal. The epidemic was stated to have been comparatively light in character and to have chiefly prevailed amongst the Jewish portion of the population. From Smyrna the disease spread to Denizli, where 30 persons were attacked and 10 died, and in the first half of October to Boudja, Bourla, and Nasli, where, however, cases only occurred sparsely.

Prior to the arrival of the pilgrim ships, Constantinople had been exposed to danger from cholera from the north, owing to the outbreak of the disease in Roumania, and to the consequent exodus thence of Armenian and Greek dock labourers. On August 15th the S.S. "Marsalia," with 500 passengers on board arrived at Sinope from Roumania, having had three deaths from cholera on the voyage, while four more cases were removed from the vessel on her arrival. She was followed by other vessels, and by August 20th there were upwards of 2,000 persons in the lazaretto at Sinope, there being at the same time several cases of cholera at the hospital there. On August 22nd there were 27 cases of cholera at the hospital and from three to four deaths daily. By September 9th cholera had ceased at Sinope in the lazaretto, and neither in the town or neighbourhood were any cases observed.

The first case of cholera confirmed at Constantinople was that of a Greek seaman working on a tug belonging to the Quay Company. This man was attacked on August 18th and died on August 20th at the Jeremiah Hospital. On September 3rd a seaman who had worked on a lighter in the harbour, and who had been taken ill three days previously, died at the French Hospital. At the same time two cases occurred at Mumhané (Galata) amongst harbour workmen, and two Greek seamen in the Greek hospital were attacked by choleraic diarrhœa. From these facts it follows that the Golden Horn area of Constantinople was the first to be infected, and that the earliest cases occurred amongst the maritime population of the harbour quarter of Galata. As regards these cases, Dr. Mordtmann is of opinion that whilst a connexion with the epidemic foyer in the Lower Danube cannot be directly established, the dates and other circumstances render such connexion highly probable. He also thinks that with the later spread of cholera in other parts of the capital these early cases had no concern; that, for instance, the outbreak immediately following in the lunatic asylum at Scutari and in the Hasskoi quarter, the two first centres whence other parts of the city received cholera had a different source of infection.

At Hasskoi at the Golden Horn, in the Turkish quarter of Turschudju, a person was attacked with cholera on August 22nd and died three days later. On August 28th another member of the same family sickened and died. On August 29th an outbreak of cholera occurred at the lunatic asylum at Scutari (600 inmates), and by September 6th 53 of the inmates had been attacked, of whom only nine recovered. A few days previously to this a lunatic from Tulcea (Roumania) had been placed in the ward where the first case occurred. This person, however, neither at the time of his arrival nor later, suffered from cholera. According to Dr. Mordtmann, the outbreaks in the Turkish quarter referred to above, and in the lunatic asylum, were most probably to be connected with the arrival of the first of the pilgrim ships from the Red Sea on August 20, 21, and 23. The presence of persons sick with cholera on board these vessels is indeed to be excluded, but on the other hand cholera-infected clothing was undoubtedly brought, as also various relics, such as rags, earth, &c. from Mecca which were supposed to possess miraculous curative virtues; and there is no doubt that at ports in the Black Sea the appearance of cholera and the arrival of pilgrim ships were coincident. In some cases the connexion between the occurrence of cases and the reception of infected clothing or bedding was directly traced. It is further to be observed in this connexion that lunatics were supposed to be peculiarly amenable to the miraculous influence of relics from Mecca. Whatever the origin of cholera in Constantinople the disease spread in the city. It was present in the lunatic asylum at Scutari from August 29th to October 20th, and of the 600 inmates 116 were attacked, and 85 died. A military cordon was placed round the asylum; but as usual, with little effect, and the disease spread to the neighbouring portions of the town of Scutari, and appeared in the Selimié barracks and at the military hospital of Haidar Pacha. In the town sporadic cases appeared on September 7th, an especially bad centre being formed at a ruinous khan situate below the asylum, and inhabited by some 50 Kurdish workmen.

An important centre, which led to the conveyance of the infection to the provinces, was formed at the Selimié. Barracks, and the adjoining military hospital of Haïdar Pacha, where, between October 3rd and 30th, 86 cases, of which 58 were fatal, occurred. Although the barracks were subsequently evacuated, and rigorously disinfected, the soldiers who had been quartered there carried the disease with them to other stations. On November 25th, cholera broke out in the military hospital at Tripoli; on December 9th, at the military hospital, Salonika; on December 13th, at Lule Burgas, on the Adrianople–Constantinople line; and on December 24th, at Demotika, on the Dedeàgatsch line.

During September the disease lingered in Scutari, and was practically confined to that quarter, but subsequently appeared in all the quarters of Constantinople. Owing to the confusion of the records of the sanitary department, in consequence of an earthquake, I have not been able to obtain complete statistics of cholera in Turkey. For the following Table IV., in which the number of cases and of deaths from cholera in Constantinople during the period from the outbreak of the epidemic to the end of the year are given, I am indebted to the Report of Dr. Mordtmann already referred to.

TABLE IV.

STATISTICS of the CHOLERA EPIDEMIC at CONSTANTINOPLE during 1893.

Period.	Total recorded Cholera	
	Attacks.	Deaths.
From August 20th to September 9th	88	57
„ September 10th „ „ 16th	65	47
„ „ 17th „ „ 23rd	13	11
„ „ 24th „ „ 30th	30	18
„ October 1st „ October 7th	62	17
„ „ 8th „ „ 14th	32	21
„ „ 15th „ „ 21st	66	34
„ „ 22nd „ „ 28th	30	25
„ „ 29th „ November 4th	13	12
„ November 5th „ „ 11th	112	70
„ „ 12th „ „ 18th	241	132
„ „ 19th „ „ 25th	278	129
„ „ 26th „ December 2nd	270	152
„ December 3rd „ „ 9th	411	172
„ „ 10th „ „ 16th	176	111
„ „ 17th „ „ 23rd	135	81
„ „ 24th „ „ 30th	89	42
„ „ 31st „ January 6th, 1894	41	29
Totals	2,152	1,160

From the above Table, it appears that during the 20 weeks ending January 6th, 1894, the occurrence of 2,152 cases of cholera was notified at Constantinople (population about 800,000), and that of these 1,160, or nearly 54 per cent., proved fatal.

Also it will be observed from the above Table that there was a marked diminution in the number of deaths in the week ended November 4th, followed by a rapid increase in the succeeding weeks until, in the week ending December 9th, 411 attacks, with 172 deaths, from cholera were recorded. Dr. Chantemesse, of the French Sanitary Service, who, at the request of the Ottoman Government, went to Constantinople to organise the sanitary defence against cholera, states* with regard to this that:—

"From the 20th to the 30th October the violence of the epidemic underwent marked diminution. During this period of 10 days the weather was continuously very fine; the cholera attacks were both less numerous (35 in 10 days), and less severe; the epidemic had apparently entered on a phase of marked diminution.

"From the 1st to the 5th of November the improvement was still more marked. Several days passed without any record of new cases of cholera. Certain observations, however, made during the course of the epidemic hardly warranted the hope that the cholera would quietly die out. They indicated, indeed, the necessity of making special reservations as to the possibility, even probability, of a recrudescence of the epidemic.

"Twice during the month of October rain had fallen, and each fall of rain had been followed two or three days later by a smart recrudescence of the epidemic. The rain having only lasted a few hours, the recrudescence was only of three or four days' duration, when it gradually died out. At the beginning of November the period of autumn drought would come to an end, and, notwithstanding the apparent disappearance of the epidemic, one could not but fear its revival at the moment when the abundant rains would once more wash into the surface soil in and around the reservoirs, and carry into water conduits the surrounding impurities.

"A violent storm broke out on November 3rd. On the 6th 36 new attacks were recorded. On the 7th there were 28 fresh cases, and on the 8th there were 23. The rainfall had once more clearly indicated its close relationship with the propagation of the epidemic."

The quarters which suffered the most were those lying nearest the harbour. In the villages on the Bosphorus a number of sporadic cases of cholera occurred. A somewhat important centre was formed at the little fort of Sira Tasch, above Bujukdere. In the Asiatic villages hereabouts, 30 cases of cholera, and 9 deaths were recorded in 1893, and in the European villages, 50 cases, of which 34 were fatal, were reported. From Constantinople the disease was carried by fugitives to Adrianople, Gallipoli, and Broussa, where, however, no centres were formed.

Towards the end of September cholera appeared at the town of Eskischehr, in the middle of the railway from Imid to Angora, and the starting point in a line in course of construction to Kutahia. Prior to this outbreak, a suspicious epidemic had raged amongst ballast workmen at the station of Inönü, which had occasioned many deaths, and from here many of the workmen fled to Eskischehr in the hope of finding employment there. At Eskischehr there are hot baths, used in the daytime exclusively by women, but which were resorted to at night for the sake of the heat, by homeless workmen. From September 24th corpses were found almost daily in the bath, as well as some people suffering with "blue sickness," a local synonym for watery diarrhœa with cyanosis. Between September 20th and October 10th about 20 corpses were found, and the first cases of cholera in the resident population occurred amongst Turkish women who had used the baths.

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* Épidémie cholérique à Constantinople en 1893. Rapport présenté par M. le Dr. Chantemesse, inspecteur-général adjoint des services sanitaires, délégué de M. Pasteur auprès du Gouvernement Ottoman. Recueil des Travaux du Comité Consultatif d'Hygiène publique de France. Tome XXIII., page 240, Melun, 1894.

From Eskischehr cholera spread to Seïdi Gazi, but in both places it had disappeared by the end of November.

In several ports on the southern shores of the Black Sea there were isolated cases of cholera; the most severe outbreak occurring at Trebizond, to which place the disease was introduced by soldiers from Rizé. The first case in Trebizond was notified on November 14th; the disease lasted 52 days and attacked 486 persons, of whom 327, or 67·2 per cent., died. The following Table V., which was compiled by H.M. Consul at Trebizond, shows the incidence of cholera on the several classes of the community living in that town:—

TABLE V.

Statistics of Attacks and Deaths from Cholera in the several Communities living at Trebizond for the Period November 14th, 1892, to January 5th, 1894.

Inhabitants.		Cholera Attacks.				Cholera Deaths.			
Community.	Number.	Males.	Females.	Total.	Rate per 10,000 of the Population.	Males.	Females.	Total.	Rate per 10,000 of the Population.
Turks - -	22,000	167	142	309	*140·1*	116	107	223	*101·0*
Greeks - -	7,000	59	59	118	*168·5*	29	42	71	*101·4*
Armenians -	6,000	38	21	59	*98·3*	21	12	33	*55·0*
	35,000	264	222	486	*139·0*	166	167	327	*93·4*

(2.) *Mesopotamia.*

On May 17th, 1893, three persons were attacked with symptoms of cholera at Amarah, a small town in Mesopotamia, situate on the River Tigris. All these cases proved fatal on May 20th. Further cases officially declared to be cholera occurred on subsequent days, and on May 24th it was reported that the inhabitants were taking flight. On May 26th two persons were attacked with choleraic illness at Basrah, the chief town of the villayet of the same name, and on the following day the occurrence of two cases of cholera was officially confirmed in that city. On May 27th cholera appeared at Shatra a town situate close to a branch of the Shat-el-Haï canal, which connects the Tigris with the Euphrates, and the occurrence of the disease was also reported amongst the Arab tribes of Abdulla Bin Ali and Beni Mallitch camped in the Muntifik district in the neighbourhood of Amarah.

As to the route by which this cholera was introduced into the country no information has been received, but it is to be observed that it was in the Muntifik district of Lower Mesopotamia that cholera first appeared in the diffusion which commenced in 1889 and which continued throughout the two following years. It is also to be noted that cholera had been prevalent in western Persia in the winter of 1892-93, and it is possible that the disease may have been brought from there.

In order to stop the spread of cholera towards the northern portion of Mesopotamia, where the urban population is greater than in the south, the

Ottoman Government on May 27th ordered that all travellers coming from the infected districts in the direction of Baghdad should be stopped, and at the same time requested the steamship companies serving the Tigris to refuse to take passengers from the infected area. Cholera continued to spread in Basrah during the early weeks of June, causing from 10 to 12 deaths daily. Many of the inhabitants fled to the villages in the neighbourhood, and thus fresh centres of the disease were formed. In a report of the Sanitary Inspector at Baghdad, dated June 19th, it was stated that at Abu Kasib and the surrounding villages where many inhabitants of Basrah had found hospitality, there had been 293 deaths from cholera between June 10th and June 19th.

On June 14th cholera appeared at Zilha near Kurna, and on June 16th a case was reported to have occurred at the quarantine station at Kut. On June 16th the disease broke out in the Mudirlik Shattul Arab, where, between that date and June 19th, 21 persons were attacked by cholera and 15 died. On June 18th cholera showed itself among the nomad tribes of Hassan Khaiyan encamped near the Euphrates between Kurna and Suk-esh-Shiukh, and on the following day (June 19) its presence was reported amongst the tribes of Dhafeera camped near Zubeir. The disease continued to spread in the neighbourhood of the places already invaded, and, besides several villages and encampments in the Muntafik, it appeared at the important town of Nasrieh, situate at the junction of the Shat-el-Haï canal with the Euphrates, on June 28th; at Kurna, a town situate at the junction of the Tigris and Euphrates, on July 2nd; and at Suk-esh-Shiukh on July 29th. By the beginning of August nearly all the more important towns of Lower Mesopotamia had been invaded, and many of the nomad tribes of the Muntafik district had suffered severely from the disease. The total deaths from cholera in the Basrah villayet between May 17th to August 5th were officially reported to have been 977 in number.

On August 24th the appearance of cholera was reported among the soldiers in the barracks at Baghdad, and on the following day (August 25th) its presence in that city was officially confirmed. Here the disease spread rapidly, and on September 1st the Sanitary Inspector, when giving a return of the deaths from cholera, stated that it was impossible to record the number of attacks. The daily number of recorded deaths from cholera in Baghdad reached its maximum, 57, on September 6th; after that date the numbers gradually decreased, and the epidemic was practically over by the beginning of October, during that month only 18 deaths being reported. Altogether from the outbreak of the disease on August 24th, to October 28th when the last death took place, 693 deaths from cholera were officially recorded to have taken place in Baghdad.

During September and October cholera became generally diffused throughout northern Mesopotamia; extending on the one hand north-east from Baghdad to Madeli and Khanikin on the Turko-Persian frontier, and on the other hand south-west from Baghdad to Kerbella, Hilleh, Hindiah, and to the important Arab tribes encamped in the neighbourhood of these towns.

In Table VI. a summary is given of the daily returns of the Sanitary Inspector of Baghdad which were forwarded to the Foreign Office by Colonel Mockler, H.M. Consul-General at Baghdad. The approximate date of the occurrence of the first recorded case of cholera in 1893 in each infected place is also given in the Table.

From this Table it will be seen that during 1893, 4,320 deaths from cholera were officially notified as having occurred in Mesopotamia,

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a figure no doubt considerably below the actual number. For, as regards several places where cholera was said to have appeared, no returns were apparently received; whilst in the case of some of the Arab tribes of Muntafik the Government Medical Officers were repulsed, and information as to sickness and deaths refused.

TABLE VI.

Showing Total Deaths from Cholera recorded in the Towns, Villages, and Nomad Tribes of Mesopotamia during 1893.

Town, Village, or Name of Arab Tribe attacked by Cholera in 1893.	Date of First recorded Death from Cholera, 1893.	Total Deaths recorded from Cholera, 1893.
Amarah	May 17	8
Basrah	" 26	365
Shatra	" 27	188
Abou Kasib	June 10	309
Zilha	" 14	7
Kut-el-Haï	" 16	2
Shattul Arab (Mudirlik)	" 16	8
Zubeir and neighbourhood	" 19	58
Hassan Khaijoun tribes in Muntafik	" 20	14
Menawi, near Basrah	" 22	3
El Dérédji	" 22	5
Beni Khaleed	" 22	30
Avassim	" 22	
El Hamar	" 28	1
Nasrieh	July 2	130
Kurna	" 2	22
Haï	" 8	1
Hammassih	" 8	5
Kreyah	" 25	10
Suke-esh-Shiukh	" 29	49
Baghdad	Aug. 24	693
Taouk	Sept. 7	8
Kiarmieh	" 12	97
Mendeli	" 14	142
Monchori tribes, near Kerbella	" 14	18
El Fetha tribes	" 19	168
Hilleh	" 23	178
Gueret	" 25	38
Horduhum	" 26	95
Hindieh	" 27	43
Beni Hassan tribes, near Hindieh	" 30	548
Karke tribes, near Kerbella	Oct. 6	140
Nedief	" 8	14
Khanakin	" 9	58
Djelcha, near Kerbella	" 9	73
Villages between Soulahieh and Kerkouk	" 6	29
Musseyib	" 10	26
Kiabouri tribes, near Kerbella	" 10	204
Aliyava	" 12	5
Kizilrabat	" 12	20
Bakuba	" 12	32
Abukouvieh, near Kerbella	" 13	43
Soulahieh	" 13	18
Karatiji	" 13	5
Abu Nafash, near Kerbella	" 13	80
Kadimham	" 14	1
Kefil, near Nedjef	" 14	5
Samava	" 15	139

Town, Village, or Name of Arab Tribe attacked by Cholera in 1893.	Date of First recorded Death from Cholera, 1893.	Total Deaths recorded from Cholera, 1893.
Esmavaeh, near Nedjef	Oct. 18	6
Koufah	„ 25	52
Diwanieh	„ 28	11
Hanguine	Nov. 2	5
Kerbella	„ 9	108
Altoun Keupron	„ 25	3
		4,820

From the foregoing brief account it will be seen that in 1893 cholera formed three centres in Mesopotamia; the first in June and July at Basrah, and amongst the Arab tribes of the Muntafik; the second during the last weeks of August and the beginning of September at Baghdad; and the third at the end of September amongst the Arab tribes encamped in the neighbourhood of Hindiah, Hillah, and Kerbella.

PERSIA.

At the end of 1892 cholera still prevailed in the north-western and south-western Provinces of Persia, notably at Sakiz, at Suj Bulak, and at Sinna, chief towns of Persian Kurdistan, situate in close proximity to the Turkish frontier. Cholera also persisted throughout January at Tabriz, near the Caucasus, at Zinjan, Khorremabad, Nihavend, Mal-Amir, Kum, Saveh, all in the west of the country, and at Shiraz and Bunder-Abbas in the south-west. In April 1893 cholera was still reported to be prevalent at Sakis. In July cholera appeared in Amol, Lahijan, Firuzkuh, and other localities in the Province of Mazanderan, situate on the Caspian Sea, to the north of Teheran. The prevalences of cholera referred to above were apparently a continuation of the epidemic of 1892. In August, however, a fresh importation took place from Mesopotamia, through river traffic on the Karun, a tributary of the River Tigris, spreading from village to village until it reached the town of Sushter, where 130 deaths were recorded between August 7th and 22nd, and from thence, it re-invaded the south-western Provinces. From August onwards cholera continued to spread throughout the country, but as to details very little information has been received. Towards the middle of September cholera appeared at Teheran, having probably been brought there from the Province of Mazanderan. At first there were only isolated cases, but by the beginning of October the epidemic had increased to such an extent that a daily average of 60 deaths was reached. During October cholera continued to spread in the south-western Provinces, and in the northern Province of Mazanderan, where, after invading Barfurush on the Caspian, and Asterabad, it took an easterly course towards the Province of Khorasan. During the later weeks of October and the commencement of November the weekly number of deaths recorded from cholera was from 1,000 to 1,500. Although no reliable figures are available as to the mortality from cholera in Persia in 1893, it is estimated that between May 1892 and the end of 1893 at least 150,000 deaths must have taken place from that cause, and that of these some 70,000 occurred in 1893.

Russia.

During the winter of 1892–93, the recorded number of cases of cholera in Russia was very small, many provinces being entirely free from the disease. In those provinces in which it still lingered it continued to diminish until April, during which month only 80 cases and 30 deaths from cholera were reported for the whole Empire. With the advent of warmer weather, the disease, however, again became active, and gave rise to great mortality, although by no means to the same extent as in 1892.

In June cholera became epidemic in the Provinces of Podolia and Bessarabia, and in the City and Province of Orel. During July, according to information furnished by the Medical Department of the Ministry of the Interior, cholera assumed an epidemic form in the district of Khotinsk, in the Province of Bessarabia; in the districts of Berditchev, Lipovetz, and Tarashtchansk in the Province of Kief, and in the town of Kief; in the district of Fatej, in the Province of Kursk; in the city of Moscow, in the districts of Bolkhovsk, Mtzensk, Kromsk, and Orel, in the Province of Orel; in all the districts of the Province of Podolia, especially in those of Bratzlav, Gaisinsk, and Podolsk; in the district of Novosilsk, of the Province of Tula, and in the town of Tula; in the districts of Ananieff and Tiraspol, of the Province of Kherson, and in the town of Belostok; and in the regions of Kuban and the Don Cossacks. In the following Provinces, namely, Vladimir, Volhynia, Voronezh, Viatka, Ekaterinoslav, Kaluga, Moscow, Mogilef, Nijni Novgorod, Perm, Tver, Tobolsk, and Tomsk there were scattered cases of cholera only amongst persons who had returned from Moscow, or from the Provinces of Orel, Podolia, or the Don Cossack Region. Cases suspicious of cholera also occurred in July, in the Provinces of Kazan, Riazan, Samara, Saratof, Simbirsk, Penza, Baku, Orenburg, Tambof, Stavropol, Ufa, Astrakhan, Tchernigof, and St. Petersburg. During August and September cholera continued to spread throughout the Empire, and in the latter month the disease was especially widespread in the Provinces of Kief, Ekaterinoslav, Kursk, Voronezh, Orel, Mogilef, Tula, Moscow, Vladimir, Kazan, Volhynia, Podolia, and Grodno, and during this month also cholera became extensively and fatally prevalent in St. Petersburg. In October a considerable decrease in the number of cases took place, though the attacks and deaths still reached very high figures in the Provinces of Lomza, Volhynia, Podolia, Kief, Ekaterinoslav, Kursk, Orel, Tula, Moscow, Kazan, and Samara. In October, also, cholera invaded certain Provinces which had hitherto escaped, for example, Lublin, Olonetz, and Pskof, whilst in Siberia cases were still recorded in the Provinces of Tobolsk and Tomsk, and a few were notified in Akmolinsk and the vast territory of Uralsk. Towards the end of November the epidemic showed symptoms of diminution throughout the whole of Russia, and in only one Province, that of Tchernikof, did the number of cases amount to a hundred per week.

In Map I. the progress of cholera, month by month, throughout European Russia and the Caucasus during the epidemic of 1893 may be traced by distinctive colourings.

In Tables VII., VIII., and IX. are given the statistics of cholera in the several Provinces of European Russia, of the Caucasus, and of Asiatic Russia respectively. In order to enable the reader to form an opinion as to the differences in the distribution of cholera in the epidemics of 1893 and 1892, I have given in the tables for each Province the cholera attack and death rates for 1892 as well as for 1893.

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TABLE VII.

STATISTICS of CHOLERA in the several PROVINCES of EUROPEAN RUSSIA during the Year 1893.

[Provinces printed in italics indicate that some isolated cases of cholera were reported to have occurred there in January.]

Name of Government or Province.	Date of Occurrence of first recorded Case of Cholera, 1893.	Total recorded Cholera		Rates per 10,000 of the Population in 1893. Cholera		Percentage of Attacks to Deaths. "Fatality."	Rates per 10,000 of the Population in 1892. Cholera	
		Attacks.	Deaths.	Attacks.	Deaths.		Attacks.	Deaths.
Podolia	Jan.	21,185	7,593	81·1	28·8	35·8	14·8	5·4
Volhynia	Jan.	5,808	2,303	25·5	9·1	39·6	4·9	1·8
Bessarabia	Jan.	700	326	4·4	2·0	46·6	19·4	8·1
Kief	Jan.	7,679	2,858	24·4	9·1	37·2	33·6	11·8
Don Cossacks	Jan.	2,875	1,450	13·8	7·0	50·5	181·2	88·0
Saratof	Jan.	1,417	645	5·8	2·6	45·5	172·1	86·6
Samara	Jan.	2,360	1,116	8·9	4·2	34·2	155·6	68·2
Ekaterinoslav	Feb. 1/13	2,432	1,094	14·6	6·6	45·0	25·8	11·4
Orel	Feb. 18/March 2	6,133	2,225	28·7	10·6	36·3	7·1	3·0
Nijni Novgorod	Feb. 21/March 5	2,349	1,234	5·1	8·0	52·5	28·0	12·4
Astrakhan	Feb. 22/March 6	567	295	6·4	3·3	52·0	249·4	124·2
Kazan	Feb. 26/Mar. 10	2,401	1,149	10·9	5·2	47·8	37·9	16·9
Kharkof	March 3/15	1,038	554	4·2	2·2	53·4	25·5	10·4
Tula	March 8/20	3,794	1,112	25·1	7·2	29·3	8·4	2·4
Simbirsk	April 5/17	1,149	536	6·9	3·2	46·7	102·8	44·0
Tchernigof	April 15/27	1,856	65[illegible]	8·3	3·0	35·1	7·0	2·2
Kursk	May 20/June 1	4,311	1,694	16·8	6·6	39·3	39·7	16·6
Moscow	May 23/June 4	3,518	1,537	15·8	6·9	43·7	6·8	3·5
Orenburg	May 29/June 10	9	1	0·1	—	—	74·6	38·7
Penza	June 6/18	169	73	1·0	0·4	43·2	48·3	21·9
Kherson	June 19/July 1	1,876	842	8·5	3·8	44·9	21·9	10·1
Tver	June 20/July 2	41	27	0·8	0·2	65·9	0·3	0·1
Viatka	June 20/July 2	600	286	2·0	0·9	47·6	34·3	15·6
Tambof	June 25/July 7	494	261	1·7	0·7	52·9	73·3	31·3
Vladimir	June 27/July 9	1,337	518	9·0	3·6	38·7	1·9	1·1
Taurida	July 7/19	1,287	689	11·3	6·0	53·5	25·5	12·0
Riazan	July 9/21	352	194	1·8	1·0	55·1	9·0	4·6
Kalisz	July 3/25	415	229	?	?	55·2	—	—
Ufa	July 16/28	572	250	2·7	1·5	43·7	35·3	16·8
Mogilef	July 16/28	2,288	868	16·5	6·7	38·0	1·6	0·7
Kaluza	July 16/28	276	148	2·4	1·3	53·6	0·06	0·06
Grodno	July 22/Aug. 3	1,783	669	12·9	5·4	37·5	0·5	0·3
Perm	July 23/Aug 4	170	84	0·6	0·3	49·4	15·0	7·3

TABLE VII.—*continued.*

Name of Government or Province.	Date of Occurrence of first recorded Case of Cholera, 1893.	Total recorded Cholera		Rates per 10,000 of the Population in 1893. Cholera		Percentage of Attacks to Deaths. "Fatality."	Rates per 10,000 of the Population in 1892. Cholera	
		Attacks.	Deaths.	Attacks.	Deaths.		Attacks.	Deaths.
Voronesh - -	July 30/Aug. 11-	2,721	1,402	*10·3*	*5·2*	*51·5*	*89·4*	*44·9*
Yaroslavl - -	Aug. 2/14 - -	1,030	492	*8·6*	*4·1*	*47·8*	*10·4*	*4·6*
Poltava - -	Aug. 3/15 -	1,313	601	*4·6*	*2·1*	*45·8*	*7·0*	*3·0*
Minsk - -	Aug. 5/17 - -	1,325	537	*7·1*	*3·1*	*40·5*	*0·2*	*0·4*
Kostroma - -	Aug. 6/18 - -	363	142	*2·6*	*1·0*	*38·7*	*3·1*	*1·5*
Smolensk -	Aug. 13/25 - -	117	48	*8·8*	*3·6*	*41·0*	*0·3*	*0·3*
Lomza - -	Aug. 14/26 - -	2,563	1,287	*40·1*	*20·4*	*50·3*	*0·8*	*0·4*
St. Petersburg -	Aug. 24/Sept. 5 -	4,015	1,682	*21·5*	*9·0*	*41·9*	*29·0*	*8·6*
Novgorod - -	Aug. 27/Sept. 8 -	13	11	*0·15*	*0·1*	*84·6*	*0·2*	*0·1*
Radom - -	Aug. 27/Sept. 8 -	394	145	*5·1*	*1·9*	*36·8*	*9·9*	*4·3*
Livonia - -	Sept. 1/13 - -	192	112	*1·6*	*0·9*	*58·4*	*0·8*	*0·4*
Warsaw - -	Sept. 3/15 - -	396	159	*4·0*	*1·6*	*40·2*	*1·7*	*0·7*
Vilna - - -	Sept. 5/17 - -	224	98	*1·6*	*0·7*	*43·8*	*0·05*	*0·02*
Siedlec - -	Sept. 13/25 - -	257	137	*3·4*	*1·8*	*53·4*	*21·1*	*11·4*
Ploçk - - -	Sept. 14/26 - -	352	217	*5·4*	*2·9*	*61·7*	*1·2*	*0·7*
Suwalki - -	Sept. 15/27 - -	130	75	?	?	*57·8*	—	—
Lublin - -	Sept. 19/Oct. 1 -	61	31	*0·6*	*0·3*	*50·8*	*53·6*	*21·2*
Olonets - -	Sept. 19/Oct. 1 -	69	34	*1·7*	*0·8*	*49·3*	*2·7*	*1·3*
Pskof - - -	Oct. 4/16 - -	12	5	*0·1*	*0·05*	*41·7*	*0·6*	*0·2*
Vologda - -	Oct. 29/Nov. 10 -	4	3	*0·04*	*0·03*	—	*0·1*	*0·04*
Kovno - -	Oct. 29/Nov. 10 -	746	314	?	?	*42·1*	—	—
Vitebsk - -	Oct. 29/Nov. 10 -	3	3	*0·01*	*0·01*	—	*0·01*	*0·01*
Esthonia - -	Oct. 29/Nov. 10 -	4	1	?	?	—	—	—
Courland - -	?	2	2	*0·03*	*0·03*	—	*0·1*	*0·04*
Pietrkow - -	Not invaded by Cholera in 1893.					—	*0·1*	*0·02*
Kielce - -						—	*5·2*	*2·7*
Archangelsk						—	—	—
Finland - -						—	—	—
European Russia	—	99,550	41,047	9·9	4·1	41·3	33·1	15·2

TABLE VIII.

STATISTICS of CHOLERA recorded in the several PROVINCES of the CAUCASUS during the Year 1893.

Government or Province.	Date of Occurrence of first recorded Case of Cholera, 1893.	Total recorded Cholera		Rates per 10,000 of the Population in 1893. Cholera		Percentage of Attacks to Deaths. "Fatality."	Rates per 10,000 of the Population in 1892. Cholera	
		Attacks.	Deaths.	Attacks.	Deaths.		Attacks.	Deaths.
Erivan	Feb. 24/March 8	147	97	*2·1*	*1·2*	*66·0*	*130·8*	*78·6*
Kuban	Mar. 27/April 8	946	600	*6·4*	*4·0*	*63·4*	*194·4*	*102·0*
Elizavetpol	Mar. 31/April 12	31	15	*0·3*	*0·1*	*48·9*	*107·9*	*62·2*
Stavropol	June 5/17	177	88	*2·5*	*1·25*	*49·7*	*211·5*	*104·0*
Tiflis	Aug. 8/20	237	146	*2·1*	*1·8*	*61·7*	*74·9*	*39·0*
Kutais	Aug. 10/22	183	107	*0·3*	*0·1*	*58·5*	*0·6*	*0·3*
Terek	Aug. 11/23	42	29	*0·5*	*0·2*	*69·1*	*228·4*	*162·9*
Baku	Sept. 3/15	154	86	*2·2*	*1·2*	*55·9*	*160·7*	*92·2*
Kars	Nov. 3/15	48	35	*2·4*	*1·7*	*73·0*	*146·8*	*62·9*
Zakataly	—	—	—	*0·0*	*0·0*	—	*130·9*	*79·3*
Daghestan	—	—	—	*0·0*	*0·0*	—	*391·2*	*174·4*
CAUCASUS	—	**1,965**	**1,203**	**3·1**	**1·8**	**61·8**	**210·5**	**108·4**

TABLE IX.

STATISTICS of CHOLERA recorded in the several PROVINCES of CENTRAL ASIATIC RUSSIA and of SIBERIA during the Year 1893.

Government or Province.	Date of Occurrence of first recorded Case of Cholera, 1893.	Total recorded Cholera		Rates per 10,000 of the Population in 1893. Cholera		Percentage of Deaths to Attacks. "Fatality."	Rates per 10,000 of the Population in 1892. Cholera	
		Attacks.	Deaths.	Attacks.	Deaths.		Attacks.	Deaths.
Tobolsk	Feb. 26/Mar. 10	298	125	*2·1*	*1·0*	*42·0*	*186·5*	*90·3*
Tomsk	July 17/29	442	201	*3·1*	*1·5*	*45·5*	*84·5*	*16·7*
Uralsk	Sept. 13/25	22	13	*0·4*	*0·2*	*59·2*	*102·3*	*52·4*
Akmolinsk	Sept. 27/Oct. 9	19	10	*0·3*	*0·15*	*52·7*	*34·3*	*17·2*
Irkutsk	Not invaded by Cholera in 1893.						*0·7*	*0·2*
Yeniseisk							*1·4*	*0·5*
Semipalatinsk							*6·1*	*3·4*
Turgai							*7·4*	*4·2*
Semiretchinsk							*0·7*	*0·4*
Ferghana							*241·5*	*120·1*
Syr Daria							*103·8*	*73·2*
Samarkand							*213·9*	*106·9*
Trans-Caspia							*40·0*	*21·7*
Central Asia and Siberia.	—	781	349	—	—	44·7	—	—

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From Table VII. it will be seen that, in 1893, the total number of persons attacked by cholera in European Russia was 99,550, and that of these 41,047, or 41·3 per cent., died. These figures are equivalent to attack and death rates of 9·9 and 4·1 per 10,000 of the population respectively, as against attack and death rates of 33·1 and 15·2 in 1892.

Of the several provinces invaded, the greatest number of cases and of deaths occurred in Podolia, where, according to the official statistics, 21,185 persons were attacked by cholera, and 7,593 died. The next worst districts were Kief, with 7,679 cases, and 2,358 deaths; Orel, with 6,133 cases, and 2,225 deaths; Volhynia, with 5,808 cases, and 2,303 deaths; Kursk, with 4,311 cases, and 1,694 deaths.

From Table VIII. it will be seen that, in 1893, the total number of persons attacked by cholera in the Caucasus was 1,965, and that of these 1,203 or 61·3 per cent. died. The attack and death rates were 3·1 and 1·8 respectively per 10,000 of the population, as against 210·5 and 108·4 in 1892. It will be further observed that in every Province of the Caucasus, the mortality from cholera in 1893 was comparatively trifling as compared with that recorded in 1892.

The statistics of cholera in Asiatic Russia, given in Table IX., show that in 1893 the total numbers of attacks and of deaths recorded were 781 and 349 respectively. In 1892 the corresponding figures were 89,199, and 46,841.

The relative mortality from cholera of the several provinces of European Russia and the Caucasus, which obtained in 1893, is shown graphically in Map II.

From a study of the distribution of the disease in the two years, it is interesting to observe that, whereas in 1892, the greatest intensity of cholera was in the Caucasus and the Volga Provinces, and from thence gradually diminishing towards the western Provinces, in 1893, on the other hand, the greatest intensity was observed in the Ukraine or border land Provinces, from whence there was no specific gradation in any direction. This, of course, is readily accounted for, when it is remembered that, in 1892, the disease invaded European Russia by way of the Caucasus and the Volga, and thence spread westwards, whereas, in 1893, there was no such march of imported infection, but a series of recrudescences in a number of Provinces. It is also noteworthy, that the districts which suffered most severely in 1892 were the least severely attacked in 1893. This is especially the case as regards the Caucasian and Central Asiatic Provinces.

In Table X., the daily record of cholera attacks and deaths at St. Petersburg is given, and from this it will be seen that the number of new cases rose from 68 in the first week of September to 372, and 369 in the third and fourth weeks respectively, after which the weekly numbers gradually declined until the first week in December, when only 18 new cases were recorded. In the following week, however, a recrudescence of the disease occurred, 126 cases being recorded, and this increase was maintained until the end of the year. The total number of cases recorded at St. Petersburg from September 1st to December 31st, 1893, was 2,548, of which 1,149, or 45 per cent., proved fatal.

5
10
15
Cholera Mortalit
of the Population
2 and under 4·1
4·1 ,, ,, 8·2
8·2 and upward
[Mean Cholera Mo
European Russia
10,000 Population]
65
60
55
50
45
40
SWEDEN
G. of Bo
Baltic Sea
COUR
KO
GERMAN
PLOCK
GRO
SIEDLC
LUBLIN
RADOM
AUSTRO-HUNGARY
ROUMAN
TURKEY IN EUROPE
25

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TABLE X.

Daily Record of Cholera Cases and Deaths, September 1st to December 31st, 1893, at St. Petersburg.

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		Week ending	Number of Cholera	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
Sept. 1 -	9	3	Sept. 7	68	25	Oct. 6 -	27	15	Oct. 12	195	9
„ 2 -	6	3				„ 7 -	28	14			
„ 3 -	11	7				„ 8 -	27	12			
„ 4 -	12	4				„ 9 -	24	16			
„ 5 -	11	4				„ 10 -	42	16			
„ 6 -	12	2				„ 11 -	31	22			
„ 7 -	7	2				„ 12 -	16	4			
„ 8 -	13	5	„ 14	210	74	„ 13 -	24	9	„ 19	157	72
„ 9 -	21	6				„ 14 -	18	12			
„ 10 -	33	11				„ 15 -	25	13			
„ 11 -	21	9				„ 16 -	20	11			
„ 12 -	39	16				„ 17 -	28	8			
„ 13 -	46	13				„ 18 -	23	11			
„ 14 -	37	14				„ 19 -	19	8			
„ 15 -	51	20	„ 21	372	159	„ 20 -	24	10	„ 26	124	59
„ 16 -	50	20				„ 21 -	25	6			
„ 17 -	46	18				„ 22 -	17	10			
„ 18 -	59	23				„ 23 -	18	7			
„ 19 -	63	32				„ 24 -	19	13			
„ 20 -	55	23				„ 25 -	8	8			
„ 21 -	48	23				„ 26 -	13	5			
„ 22 -	61	23	„ 28	369	170	„ 27 -	11	7	Nov. 2	54	
„ 23 -	62	27				„ 28 -	8	3			
„ 24 -	40	23				„ 29 -	6	4			
„ 25 -	40	22				„ 30 -	8	1			
„ 26 -	60	23				„ 31 -	5	5			
„ 27 -	59	26				Nov. 1 -	9	5			
„ 28 -	47	26				„ 2 -	7	2			
„ 29 -	60	26	Oct. 5	295	137	„ 3 -	11	2	Nov. 9	66	35
„ 30 -	57	31				„ 4 -	12	5			
Oct. 1 -	35	23				„ 5 -	8	9			
„ 2 -	37	19				„ 6 -	8	8			
„ 3 -	43	14				„ 7 -	8	6			
„ 4 -	37	15				„ 8 -	11	2			
„ 5 -	26	9				„ 9 -	8	3			

TABLE X.—*continued.*

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month	Number of Cholera		Week ending	Number of Cholera	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
Nov. 10 -	7	3	Nov. 16	44	19	Dec. 8 -	2	—	Dec. 14	126	53
„ 11 -	5	3				„ 9 -	1	—			
„ 12 -	8	3				„ 10 -	13	3			
„ 13 -	7	3				„ 11 -	38	15			
„ 14 -	7	2				„ 12 -	34	22			
„ 15 -	4	4				„ 13 -	16	5			
„ 16 -	6	1				„ 14 -	22	8			
„ 17 -	3	—	„ 23	37	13	„ 15 -	25	13	„ 21	155	68
„ 18 -	7	2				„ 16 -	20	8			
„ 19 -	3	3				„ 17 -	10	8			
„ 20 -	6	1				„ 18 -	18	8			
„ 21 -	5	1				„ 19 -	23	5			
„ 22 -	8	1				„ 20 -	25	15			
„ 23 -	5	5				„ 21 -	34	11			
„ 24 -	3	2	„ 30	21	13	„ 22 -	22	16	„ 28	167	82
„ 25 -	2	1				„ 23 -	27	14			
„ 26 -	2	2				„ 24 -	19	11			
„ 27 -	1	1				„ 25 -	29	10			
„ 28 -	5	3				„ 26 -	22	6			
„ 29 -	2	2				„ 27 -	27	11			
„ 30 -	6	2				„ 28 -	21	14			
Dec. 1 -	5	1	Dec. 7	18	11	„ 29 -	30	7	* „ 31	70	33
„ 2 -	2	2				„ 30 -	21	12			
„ 3 -	2	2				„ 31 -	19	14			
„ 4 -	3	1							Total -	2,548	1,149
„ 5 -	2	1									
„ 6 -	1	2									
„ 7 -	3	2									

* Three days only.

The spread of cholera in Russia, according to Dr. Clemow,† was much facilitated by certain habits of the population, as, for example, the migration in the spring of large bodies of peasants from certain provinces to the south and east in search of employment; the ubiquity of beggars, and the practice of distributing to them at funerals the clothing of deceased persons; the observance of the *Pominki* or memorial feasts, which are conducted in much the same manner as Irish wakes, and where, amongst the poorer classes, the festivities often take place in the same room as that in which the death occurred, and, lastly, the periodical bazaars and fairs which are a marked characteristic of Russian life.

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† A Contribution to the Epidemiology of Cholera in Russia, by Frank G. Clemow, M.D. Transactions of the Epidemiological Society of London, New Series Vol. XIII., pp 60–82.

In addition to the examples of the diffusion of cholera by means of water, quoted in my Report on the diffusion of cholera in Russia, in 1892, I am indebted to Dr. Clemow for the following interesting information :—

> "On a certain river in the Viatka Government, cholera broke out in the village of Levashovo, and the linen of the sick was washed in the river. There were 10 other villages upon the banks of the stream, one above Levashovo, and nine below. The one above escaped cholera altogether. In seven of those below cholera became epidemic, and it was found that the two villages that escaped were the only two that had not taken their water supply from the stream.
>
> "In a certain part of the Government of Tomsk, in Siberia, a whole family started on their way to a village 25 versts away. After going some distance the daughter sickened with cholera, and all, save the father, returned to their starting point. On their return the son sickened, then the *Feldscher* who attended him. They all died. The disease then spread to those who washed the bodies of these unfortunate people. Meanwhile, the father went on to a village called Polovinnaia, where he sickened and was found lying in agony in the road. He was removed to a house, and the same day the owner of the house sickened, and later his wife. All the patients died. The disease then attacked those who washed their bodies, but was still confined to one half of the village. The village was divided into two parts by a broad stream crossed by a bridge. The peasants of the further side, hearing of these cases of cholera, determined to allow no communication between the two halves of the village, and with that object broke down the bridge, and posted a body of 20 men to see that not a soul should cross the river. Unfortunately, however, the river itself still remained as a link between the two, and after the linen of the first cases had been washed in the river whence the peasants on the further bank drew their drinking water, cholera as rapidly spread on the further as on the hither side."

From a careful consideration of the facts observed during the two epidemics of cholera in Russia in 1892 and 1893, Dr. Clemow has arrived at the following general conclusions, which I quote verbatim from the paper already referred to :—

> "1. A district which in the first year of an epidemic suffers severely, may be expected to escape lightly in the second year, and, to a certain extent, the reverse holds good.
>
> "2. Males and females are both liable to cholera, but in Russia more males than females contracted the disease. In males the death-rate was slightly higher than in females.
>
> "3. No age was exempt. Adults from 20 to 40 years of age furnished the largest number of cases. In children under 10 and in elderly people the disease proved more fatal than in people in the middle period of life.
>
> "4. In the recent Russian epidemic cholera was mainly spread directly from person to person. It was also in some instances spread by means of fomites, and, in others, through water. In every such instance the poison was contained in the evacuations of a cholera patient. There is no evidence yet published of cholera having spread in Russia through the air by 'cholera clouds.'
>
> "5. The largest bodies of water may become dangerously contaminated by the cholera poison.

"6. Too much stress cannot be laid upon the necessity of guarding all sources of drinking supply from the possibility of fœcal contamination.

"7. Errors and excesses in diet may be largely instrumental in predisposing a person to cholera.

"8. The severest degree of cold is not alone sufficient to extinguish an epidemic. Light rainfalls appear to favour the spread of an epidemic.

"9. Individual susceptibility to cholera varies. Some persons seem to be naturally immune.

"10. The incubation period of cholera varies in length. It may be as short as two hours.

"11. Racial differences may have some influence upon the incidence of cholera, but the evidence is as yet imperfect upon this point."

FRANCE.

The greatest reticence has been displayed by the authorities with regard to the diffusion of cholera in France during 1893, and no official report has been published. The following account has consequently been of necessity compiled from various sources.

At the beginning of 1893 cholera was still lingering in the Departments of Nord (at Dunkerque and at Grand-Fort-Philippe) and of Pas-de-Calais (at Calais) on the North, and in those of Finistère (at Briec) of Morbihan (at L'Orient) and Loire Inférieure (at Nantes) on the West of France. By the end of January the disease had apparently become extinct in all the Departments with the exception of Morbihan and Finistère, whence the occurrence of scattered cases was still reported. Early in February Her Majesty's Consul at Marseille reported by telegram the occurrence of cases of cholera in that city, although at the time its presence was denied by the local authorities. At a meeting of the Comité Consultatif d'Hygiène Publique de France, held on February 20th, it was stated that since the previous meeting on January 30th, some suspicious deaths had occurred at Marseille. These, however, were few in number, without epidemic character, and were not such as to constitute a "foyer." At the same time complaints were made as to the action of foreign nations in regarding Marseille as "infected." It subsequently transpired that between February 2nd and February 12th, 102 deaths from "choléra et maladies cholériformes" had been recorded at Marseille, and that of these, no less than 87 were officially declared to be due to undoubted cholera. In this outbreak the disease first appeared in the Belle-de-Mai and Canet districts of the city, whereas in October 1892 cholera began in the northern part of the old port.

On March 8th cholera reappeared in the Department of Morbihan, and on March 18th a telegram was received from Her Majesty's Consul at Brest, reporting a serious extension of the disease at L'Orient. It rapidly spread to other communes in the neighbourhood, and by April 9th had given rise to 476 cases and 178 deaths in 25 communes. In Table XI. is given the number of cholera attacks and deaths recorded in the several communes of Morbihan invaded during the period March 8th to April 9th, together with the census populations of the invaded communes.

Cholera reached its maximum at Morbihan in April, after which the number of cases declined rapidly until June, when the epidemic was

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declared to be at an end. During the four months March to June, 313 deaths from cholera were recorded in this Department, of which 112 occurred in March, 151 in April, 44 in May, and 6 in June.

TABLE XI.

Showing the Number of Cholera Attacks and of Cholera Deaths recorded between March 8th and April 9th, 1893, in the several Communes of the Department of Morbihan.

Name of Commune.	Population Census.	Recorded Cholera	
		Attacks.	Deaths.
L'Orient	42,116	85	32
Riantec	5,717	57	31
Port-Louis	3,431	15	8
Le-Palais	5,113	10	8
Gavres	1,227	45	10
Plonlinec	3,693	33	11
Merlevenez	1,288	2	2
Plœmeur	12,413	19	5
Quiberon	2,884	16	9
Roserières-en-Palais	—	1	1
Crach	1,952	13	2
Caudan	7,670	6	2
Séné	2,918	16	6
Groix	4,935	1	1
Auray	6,236	57	15
Hennebont	6,972	5	5
Étel	1,926	9	1
Plougomuelen	1,952	10	6
Belz	2,856	33	5
Branderion	577	1	1
Plumeret	3,399	18	8
Saint-Philibert	—	9	2
La Trinité-sur-Mer	1,268	1	1
Brech	2,199	3	1
Vannes	21,504	6	2
Kervignac	2,650	1	1
Melrand	3,421	1	1
		476	178

During March deaths from cholera were recorded at Toulon and at Nîmes in the Departments of Var and Gard respectively, which are situate on either side of that of Bouches-du-Rhône in which lies the city of Marseille. Deaths were also recorded at Les Sables d'Olonne in the Department of Vendée.

In April a further extension of cholera in France took place. At a meeting of the Comité Consultatif d'Hygiéne held on April 24th, cholera was reported to have occurred in the lunatic asylum of Saint Athanase at Quimper in the Department of Finistère, and between April 24th and May 7th 10 fatal cases were said to have taken place there. On April 29th three deaths from cholera and three suspicious cases were reported to have occurred in the town of Quimper itself.

In May cholera assumed epidemic proportions at Les Sables d'Olonne in the Department of Vendée, 20 deaths being recorded there during the month in a population of under 12,000 persons. In the second half of

May serious outbreaks of the disease occurred in several of the southern Departments, especially in those of Hérault (at Cette, Lunel, Agde, and Montpellier), Gard (at Alais and Nîmes), Aude (at Narbonne), Var (at Toulon), and Bouches-du-Rhône (at Arles and Marseille); also in the western departments of Loire Inférieure (at Nantes and Chantenay-sur-Loire), and in the north at Rouen in the Department of Seine Inférieure. At Marseille the outbreak began on May 5th in the asylum of St. Pierre, and soon spread to the city.

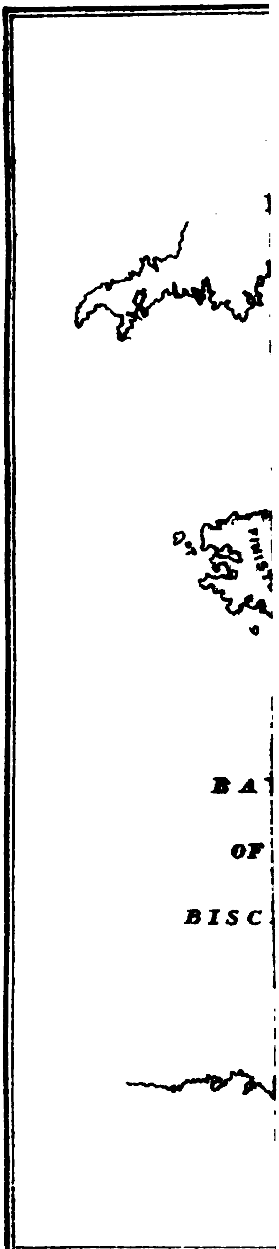
In June cholera extended to Perpignan in the Department of Pyrénées-Orientales, and from thence spread to the neighbouring villages, especially to Llupia, Bompas, Cabestany, Toulonges, Torreilles, Baixas, and Claira. Outbreaks also occurred at the towns of Rivesaltes, Thuir, and Collioure in the same Department. During the same month the disease continued to prevail epidemically at Marseille (164 deaths), Cette (34 deaths), Lunel (9 deaths), Narbonne (22 deaths), Nîmes (21 deaths), Alais (87 deaths), Agde (12 deaths), Montpellier (37 deaths), and Toulon (32 deaths), all places situate in the southern Departments, whilst new outbreaks of a more or less serious character occurred at Carcassonne (44 deaths) in Aude, at Aix (17 deaths) in Bouches-du-Rhône, at Beziers (20 deaths) in Hérault, at Vallauris (4 deaths) in Alpes-Maritimes, at Avignon (6 deaths) in Vaucluse, and at Mazamet (7 deaths) in Tarn. From a study of Map III. annexed to this report, it will be observed that during the first six months of 1893 the presence of cholera had been notified in thirty Departments, that of these ten or one third of the whole were situate in the south of France between the Pyrenees and the Alps, five were situate on the west coast and seven in the north of the country.

During July 437 deaths from cholera were recorded at Marseille, and the disease continued to prevail in many localities already invaded. New outbreaks were reported at Nice and the neighbouring towns of Antibes, Villars, La-Tarbie and Utelle in Alpes-Maritimes, at Brest in Finistère, at Clermont-d'Hérault in Hérault, and at Pamiers and Lucat in Ariège.

During August the greatest extension of cholera occurred in the western Departments and Finistère, Vendée and Loire-Inférieure. In Finistère the disease was epidemic at Brest, Ile-Molene, Lambezellec, Saint-Pierre-Quilbignon and Camaret. In Vendée a severe outbreak was recorded in the island of Noirmontier, and in Loire-Inférieure cholera continued to prevail epidemically at Nantes and at Chantenay-sur-Loire.

In September the western Departments furnished the largest number of deaths from cholera. In Loire-Inférieure 119 deaths were recorded at Nantes, and from that city the disease spread to the neighbouring towns of Saint-Herblain, Indre, Saint-Sebastian, Berton, Rize, Les-Soriniers, and Saint-Lazaire. In Finistère 158 deaths were recorded at Brest, 92 at Lambezellec, and 73 at Saint-Pierre-Quilbignon, whilst many communes were newly invaded. An interesting outbreak at Barrême, a small village in the Basses-Alpes, associated with the specific pollution of a water supply which occurred in September, will be referred to later in this report. During the last three months of the year cholera continued to linger in the Departments of Finistère and Loire-Inférieure, and by the end of December the disease was practically extinct.

I have already referred to the fact that no official report on the diffusion of cholera in France during 1893 has been published, consequently I am unable to give complete statistics of the mortality in that country. In Table XII. I have given the number of deaths recorded month by the month in 1893 as due to "Choléra et Maladies



Map shewing th
of Cholera in Fr
1893.

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Cholériformes" in the official monthly statistics[*] of towns of more than 20,000 inhabitants. These statistics are manifestly incomplete, as they contain no record whatever of deaths occurring in places having a population of less than 5,000 persons, and it is only when the monthly deaths exceeded eight that any record is given as regards places having populations of from 5,000 to 20,000 persons.

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[*] Statistique Sanitaire des Villes de France et d'Algérie de plus de 20,000 Habitants au Nombre de 117. Bulletin Menseul de l'Année 1893.

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TABLE XII.

Showing the Number of DEATHS from "CHOLÉRA ET MALADIES CHOLÉRIFORMES" recorded Month by Month during 1893 in TOWNS of FRANCE having a Population of 20,000 and upwards.

Department.	Town.	Population.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year 1893.
Loire-Inférieure	Nantes	122,576	4	—	2	4	9	27	55	127	119	22	1	—	370
Ardennes	Sedan	20,304	1	—	—	1	2	2	—	—	—	—	—	—	6
Seine	Vincennes	24,545	1	—	—	1	—	—	4	—	—	1	—	—	7
"	St. Ouen	25,851	1	—	—	—	—	—	—	—	—	—	—	—	1
Pas-de-Calais	Boulogne-sur-Mer	45,185	1	—	—	—	—	—	—	—	—	—	—	—	1
"	Calais	56,949	3	—	—	—	—	—	—	—	—	—	—	—	3
Morbihan	Rianteo	5,721	10	—	24	?	—	—	—	—	—	—	—	—	34
Bouches-du-Rhône	Marseille	406,919	—	102	—	6	10	164	437	124	16	2	—	—	861
Var	Toulon	78,349	—	3	5	2	6	32	22	9	—	—	—	—	79
Nord	Roubaix	115,390	—	1	—	—	6	3	—	—	1	1	—	—	12
Marne	Châlons-sur-Marne	25,778	—	1	—	—	—	1	1	2	—	—	—	—	5
Seine-Inférieure	Elbeuf	21,326	—	1	—	—	—	—	—	—	—	1	—	—	2
Loire	St. Etienne	133,240	—	1	—	—	—	—	—	—	—	—	—	—	1
Dordogne	Périgueux	31,036	—	1	—	—	—	—	—	—	—	—	—	—	1
Loir-et-Cher	Blois	23,686	—	1	—	—	—	—	—	2	—	—	—	—	3
Morbihan	Auray	5,776	—	—	11	10	?	—	—	—	—	—	—	—	21

„	L'Orient	42,480	—	—	26	19	4	—	2	—	—	—	—	—	51
Vendée	Les Sables d'Olonne	11,526	—	—	3	2	20	—	—	—	—	—	—	—	25
Gard	Nîmes	71,717	—	—	2	—	2	21	11	3	—	—	—	—	39
Charente-Inférieure	La Rochelle	27,140	—	—	4	5	—	—	1	—	1	—	—	—	11
Nord	Douai	30,270	—	—	1	—	—	—	—	—	1	—	—	—	2
Vosges	Epinal	23,376	—	—	1	—	—	—	—	—	—	—	—	—	1
Finistère	Quimper	17,124	—	—	—	25	10	?	—	—	—	—	—	—	35
Morbihan	Vannes	22,020	—	—	—	13	5	1	—	—	—	—	—	—	19
Rhone	Lyon	431,051	—	—	—	1	—	12	7	6	—	—	—	—	26
Seine	Levallois-Perret	39,543	—	—	—	3	—	3	—	—	—	—	—	—	6
Somme	Abbeville	20,395	—	—	—	1	—	—	—	1	—	—	—	—	2
„	Paris	2,424,705	—	—	—	2	1	—	—	—	—	—	—	—	3
Loire-Inférieure	Chantenay-sur-Loire	13,869	—	—	—	1	5	2	12	10	?	—	—	—	30
Hérault	Cette	36,187	—	—	—	—	11	34	1	—	—	—	—	—	46
„	Lunel	6,793	—	—	—	—	16	9	?	—	—	—	—	—	25
Aude	Narbonne	29,242	—	—	—	—	3	22	13	—	—	—	—	—	38
Gard	Alais	24,356	—	—	—	—	12	67	5	—	—	—	—	—	104
Hérault	Agde	7,288	—	—	—	—	2	12	18	?	—	—	—	—	32
„	Montpellier	69,834	—	—	—	—	2	37	10	14	1	—	—	—	64
Seine-Inférieure	Rouen	111,847	—	—	—	—	3	13	—	3	4	10	4	2	39
Charente-Inférieure	Rochfort	33,243	—	—	—	—	2	—	—	—	—	—	—	—	2
Aisne	St. Quintin	47,837	—	—	—	—	2	—	—	1	—	—	—	—	3
Bouches-du-Rhône	Arles	24,288	—	—	—	—	3	6	14	4	3	—	—	—	30

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On the Western Diffusion of Cholera in 1893; by Dr. Barry.

TABLE XII.—(*continued*).

Department.	Town.	Population.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year 1893.
Nord	Armentières	28,707	—	—	—	—	1	2	—	—	—	—	—	—	3
Tarn	Castres	27,117	—	—	—	—	1	2	3	2	—	—	—	—	8
Eure-et-Loire	Chartres	23,108	—	—	—	—	1	1	—	—	—	—	—	—	2
Aude	Carcassonne	28,505	—	—	—	—	—	44	21	1	3	—	—	—	69
Bouches-du-Rhône	Aix	28,193	—	—	—	—	—	17	17	1	—	6	—	—	41
Hérault	Beziers	7,288	—	—	—	—	—	20	27	2	?	—	—	—	49
Pyrenées-Orientales	Perpignan	33,878	—	—	—	—	—	9	33	4	—	—	—	—	46
„	Rivesaltes	5,879	—	—	—	—	—	14	13	?	—	—	—	—	27
Finistère	Lambezellec	16,265	—	—	—	—	—	3	12	12	92	23	?	—	142
„	St. Pierre-Quilbignon	8,483	—	—	—	—	—	3	4	23	73	?	—	—	103
Seine	Pantin	21,683	—	—	—	—	—	1	—	—	—	—	—	—	1
Haute-Garonne	Toulouse	148,220	—	—	—	—	—	1	—	—	—	—	—	—	1
Tarn	Albi	21,078	—	—	—	—	—	1	2	—	1	—	—	—	4
Seine	Aubervilliers	24,889	—	—	—	—	—	1	1	1	—	—	—	—	3
„	Ivry-sur-Seine	22,009	—	—	—	—	—	6	1	—	—	—	—	—	7
Meurthe-et-Moselle	Luneville	21,881	—	—	—	—	—	8	—	—	—	—	—	—	8
Seine	Montreuil-sur-Bois	23,706	—	—	—	—	—	3	—	—	—	—	—	—	3
Nièvre	Nevers	26,291	—	—	—	—	—	2	—	—	—	—	—	—	2
Alpes-Maritimes	Vallauris	6,288	—	—	—	—	—	4	12	?	—	—	—	—	16
Vaucluse	Avignon	42,350	—	—	—	—	—	6	5	3	—	—	—	—	14
Seine	Boulogne-sur-Seine	32,210	—	—	—	—	—	1	—	—	—	—	—	—	1
Tarn	Mazamet	14,361	—	—	—	—	—	7	12	?	—	—	—	—	19
Finistère	Brest	76,333	—	—	—	—	—	—	20	76	153	63	8	1	321

Alpes-Maritimes	Nice	96,279	—	—	—	—	—	—	67	12	8	—	—	—	87
Hérault	Clermont d'Hérault	5,079	—	—	—	—	—	—	26	12	?	—	—	—	38
Charente	Angouleme	36,407	—	—	—	—	—	—	1	1	—	—	—	—	2
Seine	Clichy	30,336	—	—	—	—	—	—	2	—	—	—	—	—	2
Seine-et-Oise	Versailles	53,358	—	—	—	—	—	—	1	—	—	—	—	—	1
Côtes-du-Nord	St. Brienc	20,202	—	—	—	—	—	—	1	—	—	—	—	—	1
Hautes-Pyrénées	Tarbes	25,690	—	—	—	—	—	—	2	—	—	—	—	—	2
Finistère	Crozon	8,262	—	—	—	—	—	—	—	1	9	?	—	—	10
„	Guipanas	8,378	—	—	—	—	—	—	—	1	12	9	?	—	22
Vendée	Noirmontier	6,103	—	—	—	—	—	—	—	15	11	?	—	—	26
Nord	Dunkerque	40,513	—	—	—	—	—	—	—	1	1	—	—	—	2
„	Cambrai	24,702	—	—	—	—	—	—	—	1	—	—	—	—	1
Haute-Loire	Le-Puy	21,064	—	—	—	—	—	—	—	1	—	—	—	—	1
Pas-de-Calais	St. Omer	21,510	—	—	—	—	—	—	—	1	—	—	—	—	1
Seine-Inférieure	Le-Havre	116,302	—	—	—	—	—	—	—	1	—	—	—	—	1
Mayenne	Laval	30,687	—	—	—	—	—	—	—	1	—	—	—	—	1
Nord	Lille	200,325	—	—	—	—	—	—	—	—	1	1	—	—	2
Saône-et-Loire	Le-Cruseot	28,339	—	—	—	—	—	—	—	—	1	—	—	1	2
Seine-Inférieure	Dieppe	22,650	—	—	—	—	—	—	—	—	7	5	3	1	16
Seine	Valenciennes	28,897	—	—	—	—	—	—	—	—	1	—	—	—	1
Finistère	Concarneau	6,121	—	—	—	—	—	—	—	—	—	3	4	11	18
Nord	Tourcoing	65,243	—	—	—	—	—	—	—	—	—	1	—	—	1
Corse	Ajaccio	20,178	—	—	—	—	—	—	—	—	—	1	—	—	1
Calvados	Caen	46,596	—	—	—	—	—	—	—	—	—	—	—	1	1
	Totals		21	111	79	96	139	644	896	479	519	149	20	17	3,170

Incomplete as this Table is acknowledged to be, it shows that upwards of 3,000 deaths were recorded as due to cholera and choleriform disease in 1893; and there is little doubt that the inclusion of the deaths from choleraic disease which occurred in the smaller towns and villages would bring the total deaths to a figure little below that observed in 1892.

The chief centres of cholera in France in 1893 were, according to the available statistics, at Marseille, 861 deaths; Nantes, 370 deaths; Brest, 321 deaths; Lambesellec, 142 (?) deaths; Alais, 104 deaths; Saint-Pierre-Quilbignon, 103 deaths; Nice, 87 deaths; and Toulon, 79 deaths.

In connexion with the serious outbreak of cholera at *Marseille* in June, it is to be noted that on June 8th Her Majesty's Consul at that city reported that deaths suspicious of cholera had occurred there, but, on inquiry, he had been informed by the Director of the Health Board, that though such cases had occurred they were all isolated, that there was no "foyer," that the general state of health was normal for the time of year, and that, under the circumstances, clean bills of health would still continue to be issued. In a despatch, dated July 7th, Her Majesty's Consul further reported, that on July 8th 13 deaths had occurred at Marseille from what the officials termed "suspected cholera," and that on July 6th there had been 8 additional deaths from the same cause. He further stated that the authorities denied the existence of "Epidemic Cholera" in the city, notwithstanding the daily occurrence of cases of the disease.

At a meeting of the Comité Consultatif d'Hygiène de France, held on July 3rd, the following statement was made with regard to cholera in the Department of Bouches-du-Rhône:—

"Des mesures absolument exagérées et injustifiées ont été prises par quelques pays contre les provenances de Marseille. L'Administration sanitaire a été avisée en même temps que la rigeur de ces mesures serait adoucie si des précautions étaient prises dans ce port au départ des navires. D'accord avec M. le Préfet des Bouches de Rhône et avec M. le Président de la Chambre de Commerce de Marseille, il a été décidé que ces précautions seraient prises et que les patentes porteraient la mention suivante."

> "Bien qu'aucun foyer épidémique n'existe à Marseille, ce navire, à raison des cas isolés qui ont eveillé certaines appréhensions, a subi la visite médicale au moment de son départ. Aucun malade n'a été embarqué. Le linge sale a été repoussé. La désinfection des objets susceptibles a été faite."

From a despatch of Her Majesty's Consul, dated August 12th, it appears that up to that date all bills of health issued at Marseille had received the endorsement noted above. There can be little doubt that this action was based on information supplied by the local authorities to the Central Government.

On reference to Table XII. it will be seen that notwithstanding the statements of the local authorities at Marseille no less than 725 deaths from "choléra" and "maladies cholériformes" were officially recorded as having taken place there during the three months, June–August 1893, 164 in June, 437 in July, and 124 in August; yet according to the authorities no "foyer" existed.

I have already referred to the outbreak of cholera at Barrême in September as of exceptional interest, and I now propose to give a short account of the salient features compiled from the official report.*

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* Choléra à Barrême (Basses Alpes) en Septembre 1893. Rapport de M. Emile Cassoute, interne des hôpitaux de Marseille, délégué à Barrême. Recueil des Travaux du Comité Consultatif d'Hygiène de France. Tome XXIII., 1893. Melun, 1894, pp. 220–228.

Barrême is a small village of 720 inhabitants situate in the Department of Basses-Alpes. The sanitary circumstances of the village appear to have been particularly bad as regards housing, drainage, and means of excrement disposal. The water supply was principally obtained from three springs, the water from two of which was conveyed to the village in iron pipes, and that of the third, known as the North Spring, in a stone drain. The first two sources appear to have been free from dangerous contamination, but the last-named was stated to have been liable, on its way to the village, to infiltration of surface drainage through the interstices between the stones. Early in September, in preparation for the reception of troops that were to be billeted at Barrême on their way to the army manœuvres, certain repairs were carried out at the source of this water, and when the work was completed a small trench was left in close proximity to it.

On September 5th the 55th Regiment of the Line left Nice to join the manœuvres. The health of the troops was good until their arrival at Entrannes, where there were cases of cholera among the civil population, and on September 7th, on reaching Entrevaux, five cases of cholera, of which one proved fatal, were notified in the first battalion. On September 8th, on arrival at St. Jullien, no further cases of cholera were confirmed, but a number of soldiers suffered from diarrhœa. The second battalion of the regiment reached Barrême on September 9th and remained there until September 11th, and were replaced by the first battalion on September 13th. On September 11th a soldier was attacked by cholera at Barrême; the company to which the man belonged was billeted in houses near the North Spring already referred to, and these men finding the trench left by the workmen above the source of supply used it as a latrine. Rain fell heavily on September 13th, and on September 14th the father of the Mayor of Barrême, who obtained his water supply fron the North Spring was attacked by cholera and died the same day. On the following day six persons were fatally attacked. On September 16th there were 11 deaths from cholera, all amongst users of the suspected water supply. In all, within 15 days from the occurrence of the first case, 43 of the inhabitants of Barrême were attacked by cholera, and of these 29 died; 21 of the deaths occurring in the first four days. The water of the North Spring was observed to be very turbid after the heavy rain on September 13th, and there can be little doubt that specifically infected excreta were washed by the rain into the supply from the trench on that day. M. Cassoute gives a number of corroborative incidents observed, *e.g.*, in one family of six persons five used the suspected water and one drank milk only; all the water drinkers were attacked with cholera whilst the milk drinker escaped.

The last of the troops left the village on September 15th for Castellane, and two men were attacked by cholera before they started, two more cases developed en route, and three more cholera attacks (all fatal) were recorded on reaching Castellane. In all eight deaths from cholera occurred amongst the troops after their arrival at Castellane.

In consequence of the severity of the outbreak at Barrême, a large number of the inhabitants were seized with panic and fled from the place, and amongst the fugitives from the contaminated quarter cholera attacks occurred at St. André, Clumane, Vaulx, and Digne.

ITALY.

As stated in my Report with respect to the western diffusion of cholera in 1892,* Italy was, with exception of the importation of two cases to Capri, free from cholera in that year. But in 1893 it prevailed extensively in several provinces of the country. The following account is chiefly taken from a Report* presented to the Italian Government by Professor Pagliani in January 1894, and to this gentleman I am also indebted for the corrected figures with respect to the attacks and deaths from cholera in Italy during 1893. Before describing the progress of cholera in that year it will be useful to refer briefly to the measures taken by the Italian Government to prevent its introduction and diffusion in the kingdom, since during 1892–93 that Government superseded the old system of strict land and sea quarantines by the more rational method of medical inspection now more generally adopted throughout Europe.

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* Supplement to the 22nd Annual Report of the Local Government Board, 1892–93, p. 194.

Italy was in 1893 especially exposed to danger both from Austria on the east and France on the west, owing to the fact that cholera had been prevalent over considerable areas in those countries in 1892–93, and that large numbers of Italian workmen who were employed in both Austria and France returned to their homes in the spring and autumn respectively. Formerly it had been the practice to stop at the frontier all persons coming from infected localities and to keep them under observation for a number of days. In 1893, instead of this, the practice was adopted of examining persons at the frontier, disinfecting soiled clothing and the like, and then allowing the travellers to proceed to their destination after taking their names and addresses. A notice was then sent from the frontier station to the local authorities of the places to which persons coming from infected localities were bound, in order that they might be kept under observation for three consecutive days after arrival. At the same time arrangements were made for isolating at once all persons attacked by cholera when travelling. In view of the especial danger of the introduction of the disease from the South of France, a small hospital was erected at Ventimiglia at the joint expense of the two countries; and in view of a similar danger from Austria there were provided for the isolation of suspicious cases at the railway stations of Udine and Pontebba hospital cars, each with two beds and the necessary furniture. Further, at Ventimiglia, Borbonecchia, Pontebba, and Udine, disinfecting appliances were provided; and at Ventimiglia a small laboratory was established for the purposes of bacteriological examination. The railway companies directed their officials to keep a careful watch over the passengers, and in the case of any showing signs of suspicious illness, they were to inform the station master at the next station, where the traveller was, if necessary, to be removed to the isolation ward which was provided at each commune.

When cholera was becoming more general in the South of France and a number of Italian workmen were returning by land and by sea from the towns where the disease had appeared, the Italian Government hired a special steamship for their conveyance, and provided it with medical attendants and all necessary means of disinfection. This vessel left Genoa on July 21st, and after having embarked at Toulon and Marseilles 306 persons, reached the sanitary station at Asinara on July 27th. During the voyage the clothing of the passengers had been disinfected, and the individuals themselves kept under supervision. After arrival and inspection at Asinara they were at once allowed to proceed to their homes without any bad results.

As regards shipping, no impediment beyond medical inspection was, as a rule, imposed. In cases where vessels on their arrival were found to be overcrowded, or which had a number of filthy passengers on board, a detention of from 12 to 24 hours was imposed, during which time the effects of the passengers were disinfected. In any case where cholera was found on board a ship, the vessel was sent to Asinara, where the sick were landed and the vessel disinfected, the passengers and crew being kept under supervision during the journey there and back. In addition to these measures with regard to travellers, a medical officer was stationed in each province, charged with the express duty of taking the necessary precautions against the spread of cholera should it be imported.

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* Relazione intorno all' Epidemia di Colera in Italia, nell' anno 1893 per il Prof. L. Pagliani, Direttore della Sanità publica del Regno. Roma, 1894.

On March 10th a case of cholera was observed at Entraque in the Province of Cuneo, in the person of a workman who had just arrived from France by the "Col de Frejus." Immediately afterwards a person who had attended him was also attacked. There was, further, a case at Piozzo of a person arriving from the Principality of Monaco. In July another workman who had returned from Marseille fell ill at Demonte, and infected his father and a younger brother, who both died. There were other cases in this Province, imported from Nice Maritime, from Arles, and other places on the French coast.

In the Province of Genova, some 10 or 12 cases of cholera were imported, but, with one exception, the disease did not spread. The exception referred to occurred in the Commune of Pallare, where on July 4th a woman with her child, both suffering from diarrhœa, came from Toulon. The child soon died, and seven further attacks took place between July 4th and 17th before the local authorities could make up their minds as to the nature of the disease. In consequence of this indecision the cases were not notified to the central authorities, and a considerable time elapsed before proper precautions were taken.

On July 8th some cases of cholera appeared at Roccoverano, a commune in the Province of Alessandria, and here also, owing to the indecision of the local authorities some delay took place in the notification of the outbreak to the Government; so that it was not until July 15th that the Provincial Medical Officer reached the district, by which time eight persons had been attacked, and the disease, having taken hold, continued to spread in Roccoverano. After investigation it appeared that the first persons attacked had acquired their infection at an inn at which a young man was staying who had recently returned from France while suffering from diarrhœa, and who was presumably convalescing from an attack of cholera.

On July 12th the Province of Porto Maurizio, which, like Cuneo, lies on the French frontier, was invaded by cholera, and subsequently 10 other cases occurred in three communes of the province.

On September 3rd cholera broke out at Livorno (Leghorn), and this outbreak was considered to have been connected with the epidemic in the south of France, as the first cases occurred amongst persons employed at the public laundries where the clothes of workmen coming from Marseille or Toulon were frequently washed. The outbreak apparently came to an end in about 10 days; but on September 26th and 27th there was a sudden recrudescence of the disease, so that from 26 to 33 cases were registered each day; and there was also a further recrudescence towards the middle of October, there occurring 47 cases and 9 deaths on October 14th, and 26 cases and 30 deaths on the 15th. This last outbreak was found to be due to the specific pollution of a portion of the public water supply. This obvious source of infection having been removed on October 16th the outbreak rapidly came to an end. The total number of cases recorded in Livorno between September 9th and October 25th was 370, and of these 173 were fatal.

Italy, as already stated, was also threatened on the Austrian frontier, and on August 17th a workman from Austro-Hungary who arrived at the station at Udine was found to be suffering from cholera. Subsequently a few cases occurred in one of the suburbs of Udine, in persons who had drunk water from a canal which received the drainage of the town. At the time when these cases occurred a considerable number of workmen were returning to Italy from Hungary where they had been engaged in the construction of an important railway line, along which the disease had developed itself. A few scattered cases were also reported about the same time to have occurred in the neighbouring Provinces of Treviso, Venezia, Rovigo, and Verona, but none led to any serious outbreak.

On July 16th the presence of cholera was first notified in the Province of Napoli (Naples) when on that date two cases were recorded, one at Pozzuoli and the other at Caivano, both of which places are situate near the city of Naples. And on July 17th the occurrence of a case was notified in Naples itself. From 16th to 21st July the disease did not spread to any extent, but on 22nd July 12 fresh cases were notified in the town, and a number of cases also occurred in the surrounding communes. From inquiries made by Professor Pagliani it was ascertained that on July 14th a sailor suffering from symptoms suspicious of cholera had been landed at the Naval Hospital from the "Umberto I." which was stationed in the military port, and a few days later several other sailors were landed from the same ship suffering from cholera. Further inquiry revealed the fact that ever since the previous autumn there had been cases of suspicious illness on board the "Umberto I.," and that although for the most part the attacks had not been serious, bacteriological examination had shown them to have been indistinguishable from true cholera. It was not until July, when, in Professor Pagliani's view, probably owing to the hot weather, the disease had become more accentuated, the surgeon of the ship found it impossible to cure the cases on board, and decided to send them to the hospital. The reason why the choleraic disease from which these sailors were suffering, and which was without doubt true cholera, had not assumed a more serious nature was, according to Professor Pagliani, explained by the fact that the persons attacked were strong and robust youths living on good and regular diet, continually under the eye of the surgeon who lived among them, and to whom they at once went when at all indisposed; and he considers that promptness in the administration of remedies at the onset of the disease is one of the most favourable conditions for curing cholera. Professor Pagliani is further of opinion that the transmission of the infection on board the "Umberto I." was from individual to individual, probably by the use in common of bedding or clothing, and certainly not through the use of drinking water or any article of diet common to the whole crew, as if this had been the case it would have produced amongst 700 men much more serious consequences. He is the more inclined to give weight to this view from the fact that during the whole time that the disease was prevalent on board the ship, up to the commencement of the epidemic in the town, not one of the workmen (about 1,000 in number) who were employed on the vessel for several hours a day, was attacked by the disease.

Cholera, as already stated, appeared in the city of Naples on July 17th and lasted until October 20th. It never, however, became virulent, the maximum number of cases notified on any one day being 26 on August 1st. The diffusion of the infection in Naples was, at least as regards a large number of cases, due, according to Professor Pagliani, to the pollution of the water of the military port, caused by the continuous discharge into it of specifically infected excreta from the "Umberto I.," a pollution which only became serious when in July the increased temperature of the sea water favoured the development of the cholera bacillus, and its diffusion along the Neapolitan shore. In a large number of cases it was ascertained that the persons attacked had immediately before the onset of the disease made use of the bathing establishment close to the military port.

The sustained and important communications of Naples, not only with the towns in its immediate neighbourhood, but with the central and southern provinces of Italy, led to the rapid diffusion of the disease, and very soon serious secondary outbreaks appeared at Fossalto in the Province of Campobasso, at Cassino in the Province of Caserta, at Salmona in the Province of Aquila, and finally at Palermo in Sicily.

The outbreak at Fossalto in the Province of Campobasso had its origin in the case of a weakly old man who had gone to Naples in the second half of July, and who after having stayed there some days at the time when the first cases of cholera had occurred there, returned home suffering from severe diarrhœa. This man died eight days after his return, but while he was still ill two women who lived in the immediate neighbourhood were fatally attacked by the disease. These cases were followed by others, and the last case was not reported until August 24th. In the meantime cholera had spread to some of the neighbouring communes. A second outbreak in the Province of Campobasso occurred at the end of September in the districts of Tsernia and Larino. In these instances the disease was said to have been imported from Solmona, a town situate in the adjoining Province of Aquila. During the two epidemic periods, 34 communes in Campobasso were invaded and 625 attacks were recorded, of which 283 proved fatal.

On August 3rd the first case of cholera was notified at Rome. It was that of a person returning from Naples, where the disease was already prevalent. Subsequently 43 further cases of cholera were reported to have occurred in the City of Rome, and of these 6 were detected at the railway station in travellers returning from Naples; of the other 37 cases the greater number were persons who had been to Naples for the sea bathing. Most of the other cases in the Province of Roma were those of day labourers who had come from the Province of Aquila to obtain employment during the winter. The total number of cases of cholera recorded in the Province of Roma between August 3rd and December 7th was 115, and of these 47 proved fatal.

The first case of cholera at Cassino, in the Province of Caserta, was notified on August 5th. Two cases occurred on the 6th, none on the 7th or 8th, one on the 9th; then suddenly 12, 17, and 12 occurred on the 10th, 11th, and 12th respectively, the numbers of fresh cases diminishing rapidly afterwards in sequence to measures taken to check the disease. The infection was stated to have been brought by a person who had stayed at Cassino for two days when travelling from Naples to Rome, at which latter place he died from cholera about the same time that the first suspected cases were notified at Cassino. At a later date a recrudescence of the epidemic occurred at Cassino. In the rest of the province, whether by direct importation from Naples, or by diffusion from Cassino, there were in all 64 communes visited by the disease. The total number of cases recorded in the Province of Caserta during the year was 681, of which 337 proved fatal.

In August also, cholera invaded several communes of the Province of Salerno, which is situate immediately to the south of that of Naples, and with which it has active commerce. But with the exception of a brief but severe epidemic in the lunatic asylum at Nocera de' Pagani, where, between September 20th and October 6th, there were 78 cases, of which 48 were fatal; and a circumscribed epidemic in the commune of Scafati, with 40 cases, of which 23 were fatal; only isolated cases occurred. In all, 225 cases and 113 deaths were recorded in this province.

On August 18th cholera appeared at Solmona, in the Province of Aquila, where it was believed to have been imported from Naples. From Solmona the disease diffused itself along the railway line which on the one side unites the town with Rome, and on the other through the Apennine valley, with Pescara on the Adriatic. In all, in the Province of Aquila, 43 communes were invaded, and 690 attacks from cholera were recorded, of which 419 proved fatal.

In August and September a few communes in the Provinces of Chieti, Teramo, and Benevento, all bordering on provinces already invaded, became infected by cholera.

About the middle of August, the presence of cholera was reported in Palermo, to which city it was regarded as having been brought from Naples, the two places being only separated from each other by a twelve-hours' sea voyage. In Palermo the disease prevailed from the middle of August to the first week in December, the maximum number of cases reported in any one day being 47 on October 1st. One or two cases also occurred in neighbouring communes. Altogether 1,140 cases of cholera were recorded in the Province of Palermo, and of these 543 proved fatal. From Palermo cholera spread to a few communes in the neighbouring Provinces of Messina, Girgenti, and Trapani.

Isolated cases were also imported, during September and October, into other provinces of Italy from districts already invaded without, however, any very serious results.

From the foregoing summary of the behaviour of cholera in Italy during 1893, it will be seen that the disease spread from three centres, the first situate in the north-west, due to direct infection from France, and affecting the Provinces of Cuneo, Alessandria, Porto Maurizio, Genova, and Livorno; the second, but of a very limited extent, situate in the north-east, due to direct infection from Austro-Hungary, affecting the Provinces of Udine, Treviso, Venezia, Rovigo, and Verona; the third, commencing in Naples and spreading from thence to the central provinces of Italy, and the northern provinces of Sicily. This third and last outbreak was the most serious of the three, and in addition to Naples, affected the Provinces of Caserta, Campobasso, Aquila, Benevento, Salerno, Avellino, Chieti, Teramo, and Rome in Italy, and Palermo, Trapani, Girgenti, and Messina in Sicily. In Map IV. the march of cholera, month by month, n Italy is shown graphically.

During the whole period from the first introduction of the disease on March 10th to December 31st, 1893, fatal attacks from cholera were recorded in 260 communes situate in 29 provinces of Italy. The total number of persons recorded to have been attacked in Italy by cholera during the period in question was 5,731, and of these 3,036 died. These numbers are equivalent to an attack rate of 18·0 and to a death-rate of 9·5 per 10,000 of the aggregate population (3,182,864) of the communes invaded.

In Table XIII. the dates of invasion by cholera of the several provinces of Italy during 1893 are given, together with the aggregate populations of the invaded communes in each province and the number of cases and deaths recorded.

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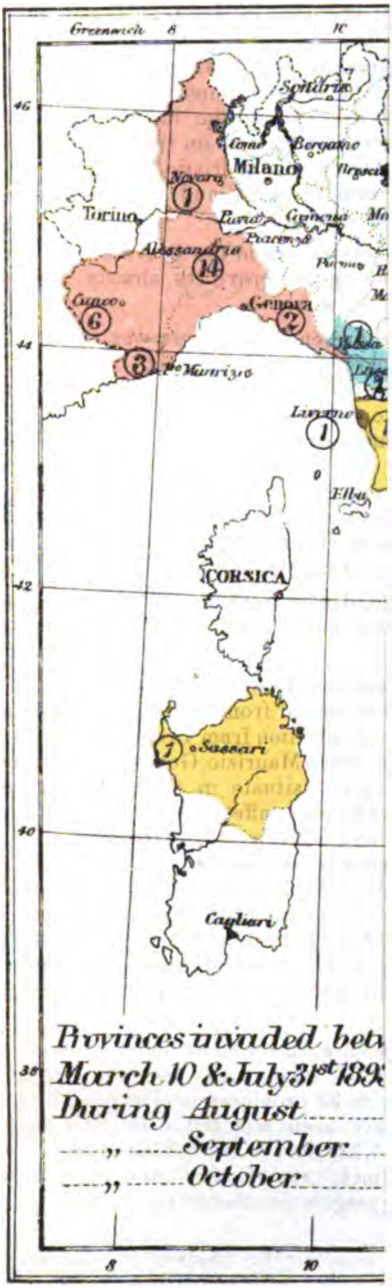
Greenwich
8
10
46
44
42
40
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Sondrio
Como
Bergamo
Milano
Novara
1
Torino
Pavia
Cremona
Piacenza
Alessandria
14
Parma
Cuneo
6
Genova
2
1
3
Pto Maurizio
Livorno
1
Elba
CORSICA
1
Sassari
Cagliari
Provinces invaded betw
March 10 & July 31st 189
During August
„ September
„ October
8
10

TABLE XIII.

Province.	Date of First Recorded Case of Cholera, 1893.	Number of Communes infected by Cholera.	Aggregate Population of invaded Communes.	Total recorded Cholera.		Rates per 10,000 Population of invaded Communes in 1893.		Per-centage of Deaths to Recorded Attacks, "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Cuneo - -	Mar. 10	6	42,547	29	14	6·8	3·3	48·3
Genova - -	July 4	2	192,694	27	14	1·4	0·7	52·0
Alessandria -	" 8	14	121,541	129	73	10·6	6·0	56·6
Porto Maurizio	" 12	3	10,881	10	5	9·2	4·6	50·0
Napoli - -	" 16	45	977,143	1,309	852	13·4	8·7	65·2
Campobasso -	" 30	34	122,891	625	283	50·5	23·0	45·3
Novara - -	" "	1	15,747	1*	1	[0·6]	[0·6]	—
Vicenza -	" "	1	10,572	1*	1	[0·9]	[0·9]	—
Roma - -	Aug. 3	5	397,500	115	47	2·9	1·2	40·9
Caserta -	" 5	47	275,977	681	337	24·7	12·2	49·5
Palermo - -	" 14	5	298,111	1,140	543	38·2	18·2	47·6
Salerno -	" "	9	91,237	225	113	24·7	12·4	50·2
Udine - -	" 17	1	34,261	12	7	3·5	2·0	58·4
Aquila - -	" 18	43	154,475	690	419	44·7	27·2	60·8
Chieti - -	" ?	11	28,094	173	46	61·6	16·4	26·6
Avellino - -	" ?	9	33,816	20	11	5·9	3·2	55·0
Messina - -	" ?	2	22,525	85	40	37·7	17·8	47·1
Rovigo - -	" ?	1	3,609	1*	1	[2·8]	[2·8]	—
Bari - - -	" ?	5	50,249	5	2	1·0	0·4	—
Lucca - -	" ?	1	46,787	2*	2	0·4	0·4	—
Massa - -	" ?	1	13,483	1*	1	[0·7]	[0·7]	—
Livorno -	Sept. 9	1	104,448	370	170	35·5	16·3	45·9
Benevento -	" "	4	9,501	6	3	6·3	3·2	50·0
Teramo - -	" "	2	3,928	2*	2	5·1	5·1	—
Girgenti -	Oct. ?	1	6,404	1*	1	[1·6]	[1·6]	—
Trapani -	" -	2	45,610	25	3	5·5	0·7	12·0
Cosensa - -	" -	2	6,592	2*	2	3·0	3·0	—
Pisa - - -	" -	1	57,734	2*	2	0·3	0·3	—
Sassari - -	" -	1	3,708	42*	42	113·2	113·2	—
Totals -	- -	260	3,182,864	5,731†	3,036	18·0	9·5	53·0

* Number of attacks in these instances not yet verified.
† Including 55 attacks not yet verified.

From the foregoing Table it appears that the largest number of cases and of deaths occurred in the Provinces of Naples (1,309 cases, 852 deaths), Palermo (1,140 cases, 543 deaths), Aquila (690 cases, 419 deaths), and Campobasso (625 cases, 283 deaths); and that the rate of fatality in the whole kingdom was 53 per cent.

From a paper* by Dr. E. Raseri, it appears that the maximum mortality from cholera took place in August and September, when 912 and 899 deaths respectively were recorded, whilst in October, November and December, the deaths registered from cholera were 733, 229 and 104 in number respectively. Complete statistics of the deaths in the several communes invaded have not yet been published, but from Dr. Raseri's paper, it appears that 518 deaths occurred at Palermo, 402 at Naples, and 170 at Leghorn, these being the largest numbers reported from any towns.

In Professor Pagliani's Report some interesting examples of the spread of cholera by means of water, are given; one of these, I think, it may be useful to quote, namely, the outbreak which occurred in the town of Cassino, in the province of Caserta. As regards this place, Professor Pagliani states :—

"The town is constructed partly on the rocky slopes of a hill, (from which it takes its name), and partly on the alluvial soil of the plain at its foot. For a long distance around the mountain, where the slope ceases, and the plain begins, there descends a great quantity of water, partly on the surface in the form of copious torrents, and partly below the surface in the stratified soil, which is very permeable, and this underground water forms a bed under the town. The soil which covers this water, is as a rule not more than two or three metres in thickness, at times even less, and only in some places does it reach a depth of more than four or five metres. The readiness with which water is obtained by merely digging for it, coupled with the fact that such water coming from the mountain keeps at the very low temperature of 11° Centigrade causes it to be generally used for drinking purposes. In fact, though somewhat hard, its freshness appears to make it an excellent water. Its value, however, is diminished by the fact that every house and every shop which has the advantage of being provided with a well for water supply, has at the same time a cesspool, the contents of which permeate into the shallow watery soil. There are thus in Cassino several hundred wells and cesspools, close to each other, establishing a continuous circulation of filth which is re-drunk by the population. Such conditions, as will be readily understood, give every facility for the propagation of an infection such as cholera."

In consequence of this condition of affairs, on the occurrence of the first cases of cholera at Cassino in August, Professor Pagliani at once went there, and took steps to secure the closure of all the wells and the deviation of all streams, with the exception of one which on bacteriological examination appeared to contain no suspicious organisms, and which was so situated as to be unlikely to be polluted. The results of this action were at once seen, for after the prohibition of the use of the suspected water, the epidemic rapidly subsided, until only a few cases remained, due to secondary infection. The epidemic was reduced to this point, when a heavy rainfall occurred, and in a few days numerous cases of diarrhœa, together with some of true cholera, were reported. It was at once thought that either by the abundance of the rain the level of the underground water had been raised, or that possibly in some other way, the only fountain which had been left for public consumption had become polluted. It was then considered necessary to shut off the only source of water supply which had been left open, and in the meantime water was brought from the aqueduct

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* Notizie Statistiche sulla Epidemia di Colera in Italia nell' anno 1893, pel Dott Enrico Raseri. Roma, 1895.

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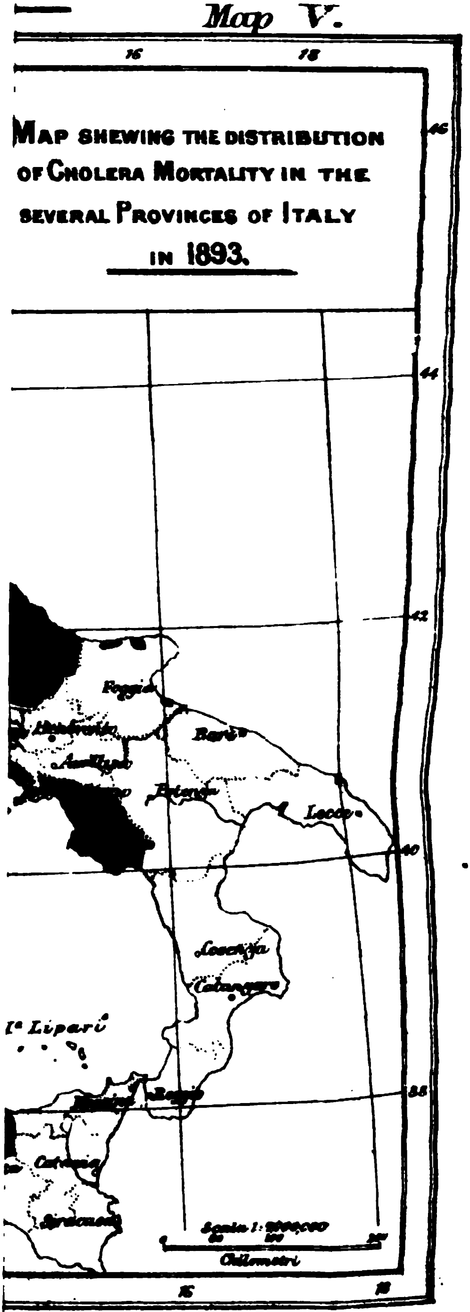
Map V.



MAP SHEWING THE DISTRIBUTION OF CHOLERA MORTALITY IN THE SEVERAL PROVINCES OF ITALY IN 1893.

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of Serino by rail, and a drift was driven into the hill in order that water might be obtained from a place where there should be no danger of its pollution by the refuse from the town. After this measure was taken, in a few days the disease ceased altogether. Professor Pagliani continues:—

"It is interesting to add, to show how true were our suspicions as to the action of the water in spreading the infection, that many weeks later a thunderstorm occurred, which turned the whole country into a lake and destroyed the works of the water supply described above. The inhabitants then re-opened the ancient wells, and although no cases of cholera appeared, there was an outbreak of enteric fever and other intestinal affections, diseases which have always been prevalent in the district, and which on the closing of the wells had well-nigh disappeared."

A further important observation with regard to the connexion of the epidemic of cholera at Cassino with water, was also made by Professor Pagliani. The large quantity of water which passes from the hill above the town into the subsoil of the plain below and which is there polluted, has been already referred to. This water after passing through the district appears upon the surface and forms a considerable stream, called the Rapido, which flows into the river Garigliano some few kilometres below Cassino. In all previous epidemics of cholera, it had been observed that the villages situate on the banks of the Garigliano, and obtaining water from its stream below the point where the Rapido passes into it, had been severely visited by the disease. It was consequently considered desirable to prevent the use of this water in 1893, when the cholera appeared at Cassino, and the necessary steps were at once taken to this end, and to provide the villages with water from other sources; and in place of cholera, as in former occasions being registered in hundreds of cases, only 30 actually occurred, these being amongst persons who had drunk the water from the river in spite of the orders that had been given.

In Table XIV. is given the statistics of cholera in the several Provinces of Italy and in Map V. the relative mortality in their Provinces is shown graphically.

App. A. No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

TABLE XIV.

Statistics of Cholera in the several Provinces of Italy during 1893.

Province.	Date of First recorded Case of Cholera, 1893.	Number of Communes invaded.	Population (Census).	Number of recorded Cholera		Rate per 1,000 Population. Cholera	
				Attacks.	Deaths.	Attacks.	Deaths.
Cuneo - -	Mar. 10 -	6	635,400	29	14	0·45	0·2
Genova - -	July 4 -	2	760,122	27	14	0·35	0·2
Alessandria -	„ 8 -	14	729,710	129	73	1·8	1·0
Porto Maurizio -	„ 12 -	3	132,251	10	5	0·8	0·4
Napoli - -	„ 16 -	45	1,001,245	1,309	852	13·1	8·5
Campobasso -	„ 30 -	34	365,434	625	283	17·1	7·7
Novara - -	„ „ -	1	675,926	1*	1	0·01	0·01
Vicenza - -	„ „ -	1	396,349	1*	1	0·02	0·02
Roma - -	Aug. 3 -	5	903,472	115	47	1·3	0·5
Caserta - -	„ 5 -	47	714,131	681	337	9·5	4·7
Palermo - -	„ 14 -	5	699,151	1,140	543	16·3	7·8
Salerno - -	„ „ -	9	550,157	225	113	4·1	2·0
Udine - -	„ 17 -	1	501,745	12	7	0·2	0·1
Aquila - -	„ 18 -	43	253,027	690	419	27·3	16·6
Chieti - -	„ -	11	343,948	173	46	5·0	1·3
Avellino - -	„ -	9	392,619	20	11	0·5	0·3
Messina - -	„ -	2	460,924	85	40	1·8	0·9
Rovigo - -	„ -	1	212,700	1*	1	0·05	0·05
Bari - - -	„ -	5	679,499	5	2	0·07	0·03
Lucca - - -	„ -	1	284,484	2*	2	0·07	0·07
Massa - - -	„ -	1	679,469	1*	1	0·06	0·06
Livorno - -	Sept. 9 -	1	121,612	370	270	30·4	22·2
Benevento - -	„ -	4	238,425	6	3	0·25	0·1
Teramo - -	„ -	2	254,806	2*	2	0·08	0·08
Girgenti - -	Oct. -	1	312,487	1*	1	0·03	0·03
Trapani -	„ -	2	283,977	25	3	0·9	0·1
Cosensa - -	„ -	2	451,185	2*	2	0·04	0·04
Pisa - - -	„ -	1	283,563	2*	2	0·07	0·07
Sassari - -	„ -	1	261,367	42*	42	1·6	1·6
Totals -	- - -	- -	**13,074,185**	**5,731†**	**3,036**	**4·4**	**2·3**

* Number of attacks in these instances not verified.
† Including 55 attacks not verified.

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APP. A

On the
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Cholera
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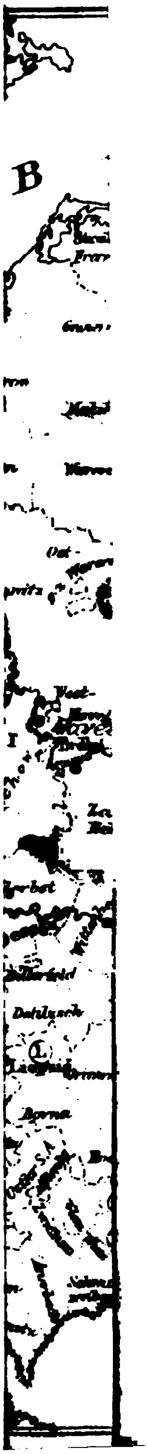

Germany.

The course of cholera in the German Empire during 1893, may be shortly summarised as follows. The first scattered cases showed themselves at Hamburg, Berlin, and Donaueschingen. The first reported attack occurred at Hamburg, on May 27th, when an office messenger employed at an establishment at which persons from all countries congregated, was taken ill with cholera. In the week from June 18th to June 24th there was a single case on each of two ships in the harbour at Hamburg. In Berlin, the first case of cholera occurred in the beginning of August. This was traced back to Russian-Polish workmen.

At Donaueschingen, in the Grand Duchy of Baden, the death of a student from cholera was recorded on August 15th, and it was ascertained in his case that he had acquired the disease at Marseilles when on a holiday. Between August 20th and the end of September a considerable number of cases, some traced directly to Holland, occurred in the districts bordering on the Rhine. These cases were for the most part amongst boatmen and their connexions, and men employed in dredging. In the early part of September a small cholera centre, the origin of which could not be established with certainty, was formed in the neighbourhood of Solingen, at a little place called Papiermühle. In the meantime, isolated cases of cholera sickness were observed at Berlin, and at Schulitz in the Elbe and Weichsel (Vistula) districts respectively. Towards the middle of September there was an outbreak of cholera at Hamburg, which was attributed to an accident at the waterworks, whereby unfiltered Elbe water containing the specific infection of cholera found access to the water mains. Subsequently, numerous cases set down to the drinking of unfiltered Elbe water occurred at Rissen, Neuland, Neuenfelde, Wittenberge, Magdeburg, Damnatz, Harburg, and other places. A severe outbreak of cholera took place about the middle of October, at Havelberg, a town supplied with unfiltered water drawn from the River Havel.

On September 22nd cholera was observed in the Oder district, and appeared on September 23rd at Stettin, where a number of cases, scattered throughout the town, were ascribed to the hasty and insufficient filtration of water taken from the River Oder, for the supply of the town.

About the middle of October the presence of cholera was confirmed in the Memel district, but there, as in the Weichsel district, the number of cases was very limited. With the introduction of cholera into Upper Silesia, towards the end of December, the importation of the disease into the German Empire came to an end.

During the whole period, from the outbreak of cholera in Hamburg on May 27th, 1893, to January 11th, 1894, 113 places in Germany were invaded, as against 269 in the previous year. The total number of persons recorded as having been attacked during the period in question was 567, and of these, 298 died. These numbers are equivalent to an attack-rate of 0·85, and to a death-rate of 0·45 per 10,000 of the aggregate population (6,669,803) of the counties and towns invaded. In addition to the 298 cases noted above, cholera bacilli were found in the dejecta of 115 persons, who showed no other symptom of the disease. In the following Table XV., the date of invasion by cholera, from May 27th, 1893, to January 11th, 1894, is given, together with the population and the numbers of cases and deaths recorded. In Map VI. the march of cholera, month by month, in the German Empire, during the autumn and winter of 1893, is shown graphically. Detailed statistics as to the several places invaded by cholera are given in Table A. appended to this Report.

TABLE XV.

CHOLERA in GERMANY 1893 (from May 27th until the end of the Year).

[Number of persons in whose dejecta cholera bacilli found, but in whom no symptoms of cholera observed given in brackets, *e.g.* (76).]

State or Government District.	County (Kreis) or County Town (Stadt Kreis).	Date of first recorded Case of Cholera.	Number of Places invaded.	Population, Census, 1890.	Number of Cholera		Rate per 10,000 of the Population, Cholera.		Deaths per cent. of Cases. "Fatality."
					Cases.	Deaths.	Cases.	Deaths.	
Hamburg	Hamburg (city and suburbs).	May 27	1	569,260	129 (76)	61	*2·3*	*1·1*	*47·3*
Berlin	Berlin (city)	Aug. 3	1	1,578,794	18 (3)	9	*0·1*	*0·06*	*50·0*
Baden	Donaneschingen	„ 15	1	24,222	1	1	[*0·4*]	[*0·4*]	—
Düsseldorf	Duisburg	„ 20	1	59,285	3	3	*0·5*	*0·5*	—
„	Neusz	„ 21	2	68,493	4	4	*0·6*	*0·6*	—
„	Mörs	„ 22	1	67,612	1	1	[*0·15*]	[*0·15*]	—
„	Ruhrort	„ 24	2	80,145	6 (2)	3	*0·75*	*0·4*	—
Koblenz	Neuwied	„ 25	1	77,350	1	1	[*0·1*]	[*0·1*]	—
Wiesbaden	Rheingau	„ 25	1	33,630	1	1	[*0·3*]	[*0·3*]	—
Bromberg	Bromberg	„ 25	1	74,247	1	1	[*0·1*]	[*0·1*]	—
Düsseldorf	Rees	„ 27	1	65,807	2	2	*0·3*	*0·3*	—
Köln	On the Rhein, near Bonn.	„ 27	1	—	1	1	—	—	—
Koblenz	Mayen	„ 28	1	63,938	3	-	*0·5*	—	—
Düsseldorf	Solingen	„ 31	4	127,715	16 (4)	5	*1·3*	*0·4*	*31·3*
Baden	Mannheim	„ 31	1	79,058	1	-	[*0·1*]	—	—
Köln	Köln (town)	Sept. 1	1	281,681	2	2	*0·07*	*0·07*	—
Düsseldorf	Mettman	„ 3	2	75,442	2	1	*0·3*	[*0·1*]	—
Koblenz	Sankt Goar	„ 7	1	39,055	1	1	[*0·3*]	[*0·3*]	—
Marienwerder	Marienwerder	„ 8	1	63,675	1	1	[*0·15*]	[*0·15*]	—
Schleswig	Altona (town)	„ 16	1	143,249	15	9	*1·0*	*0·6*	*60·0*
„	Steinburg	„ 20	1	67,439	2	1	*0·3*	[*0·15*]	—
Hannover	Hameln	„ 20	1	52,031	3	2	*0·6*	*0·4*	—
Schleswig	Kiel (town)	„ 22	1	69,172	11	3	*1·6*	*0·4*	*27·3*
Stettin	Stettin (town)	„ 22	1	116,228	89	44	*7·7*	*3·8*	*49·5*
Potsdam	Augermünde	„ 23	4	64,704	11 (1)	5	*1·7*	*0·8*	*45·5*
Stade	Geestemünde	„ 25	1	35,398	1	-	[*0·3*]	—	—
Aurich	Weener	„ 25	1	20,431	1	1	[*0·5*]	[*0·5*]	—
Lübeck	Lübeck (town)	„ 25	1	63,590	0 (3)	-	—	—	—
Hamburg	Hamburg (district).	„ 25	1	53,270	4 (1)	3	*0·75*	*0·6*	—
Frankfurt	Königsberg in Neumark.	„ 27	7	97,822	16	11	*1·6*	*1·1*	*68·7*
Stettin	Greifenhagen	„ 27	2	50,737	2	1	*0·4*	[*0·2*]	—
Stad	Kehdingen	„ 30	1	21,014	1	-	[*0·5*]	—	—

State or Government District.	County (Kreis) or County Town (Stadt Kreis).	Date of first recorded Case of Cholera.	Number of Places invaded.	Population. Census. 1890.	Number of Cholera		Rate per 10,000 of the Population, Cholera		Deaths per cent. of Cases, "Fatality."
					Cases.	Deaths.	Cases.	Deaths.	
Stettin	Randow	Oct. 4	11	115,412	60 (12)	35	*5·2*	*3·0*	*58·4*
Magdeburg	Magdeburg (town)	„ 7	1	202,234	3	2	*0·15*	*0·1*	—
Stade	Jork	„ 8	1	20,899	1	1	[*0·5*]	[*0·5*]	—
Stettin	Kammin	„ 9	1	43,632	8 (1)	5	*1·8*	*1·1*	—
Potsdam	Westprignitz	„ 10	3	72,697	39	28	*5·4*	*3·9*	*71·8*
Lüneburg	Dannenberg	„ 13	2	14,237	2	1	*1·4*	[*0·7*]	—
„	Harburg	„ 15	1	36,730	1	1	[*0·3*]	[*0·3*]	—
Stettin	Ueckermünde	„ 17	2	50,793	3	2	*0·6*	*0·4*	—
Gumbinnen	Tilsit	„ 17	1	71,666	17	8	*2·4*	*1·1*	*47·8*
„	Ragnit	„ 18	2	54,725	2	1	*0·4*	[*0·2*]	—
Potsdam	Niederbarnim	„ 18	6	163,527	10 (8)	3	*0·6*	*0·2*	—
Schleswig	Eiderstedt	„ 19	1	16,062	1	1	[*0·6*]	[*0·6*]	—
Danzig	Danzig (town)	„ 20	1	120,338	1 (1)	-	[*0·1*]	—	—
Gumbinnen	Niederung	„ 22	2	55,614	4	2	*0·7*	*0·35*	—
Oppeln	Tost-Gleiwitz	„ 24	2	100,679	5 (2)	2	*0·5*	*0.2*	—
Potsdam	Potsdam (town)	„ 25	1	54,125	3	2	*0·6*	*0·4*	—
Stettin	Usedom Wollin	„ 25	2	49,035	11	4	*2·2*	*0·8*	*36·4*
Magdeburg	Stendal	„ 26	1	62,393	1	-	[*0·2*]	—	—
Potsdam	Westhavelland	„ 27	4	59,067	4	3	*0·7*	*0·5*	—
Frankfurt	Weststernberg	„ 27	1	50,449	1	-	[*0·2*]	—	—
Liegnitz	Freistadt	„ 28	1	52,598	1	1	[*0·2*]	[*0·2*]	—
Potsdam	Templin	„ 31	1	45,236	1	-	[*0·2*]	—	—
Königsberg	Labiau	Nov. 2	2	53,220	4	3	*0·7*	*0·6*	—
Stettin	Naugard	„ 2	2	54,298	12	9	*2·2*	*1·7*	*75·0*
Königsberg	Osterode	„ 3	2	69,487	2	1	*0·3*	[*0·15*]	—
Schleswig	Rendsberg	„ 3	1	58,086	1	1	[*0·2*]	[*0·2*]	—
Lüneburg	Harburg (town)	„ 5	1	35,081	1	1	[*0·3*]	[*0·3*]	—
Potsdam	Oberbarnim	„ 7	3	84,018	3	2	*0·4*	*0·2*	—
Marienwerder	Briesen	„ 7	1	39,863	1	1	[*0·2*]	[*0·2*]	—
Potsdam	Zauch-Belzig	„ 12	2	77,105	2 (1)	2	*0·3*	*0·3*	—
„	Ruppin	„ 16	1	76,215	4	2	*0·5*	*0·25*	—
Frankfurt	Lebus	„ 28	1	92,404	1	-	[*0·1*]	—	—
Oppeln	Kattowitz	Dec. 27	1	120,762	3	2	*0·25*	*0·2*	—
„	Buthen (town)	Jan. 2, 1894	1	36,905	1	1	[*0·3*]	[*0·3*]	—
„	Zabrze	„ 11 „	1	73,717	3	1	*0·4*	[*0·1*]	—
	Totals		113	6,669,803	567 (115)	298	0·85	0·45	52·6

App. A. No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

The relative mortality from cholera in the several counties (Kreise) of Germany is shown graphically in Map VII.

The chief centres of the disease in the German Empire are given in Table XVI. Upon reference to Table A. appended to this Report, it will be seen that in the great majority of the places in Germany invaded by cholera in 1893, the disease did not become epidemic, but on the contrary, was frequently limited to one case only.

TABLE XVI.

Showing the Chief Centres of Cholera in the German Empire in 1893.

Government District or State.	County.	Town or Village.	Population.	Number of recorded Cholera		Rate per 10,000 of Population, Cholera		Deaths per cent. of recorded Attacks. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Hamburg	- - -	Hamburg	569,260	129	61	2·3	1·1	47·3
Berlin (City of)	- - -	Berlin	1,578,794	18	9	0·1	0·06	50·0
Düsseldorf	Solingen	Papiermühle	78	12	5	1,539·7	641·0	41·7
Schleswig	- - -	Altona	143,249	15	9	1·0	0·6	60·0
		Kiel	69,172	11	3	1·6	0·4	27·3
Stettin	- - -	Stettin	113,421	89	44	7·8	3·9	49·4
	Randow	Warsow	1,223	20	11	163·4	89·9	55·0
		Gartz on Oder	4,431	14	6	31·6	13·5	42·9
	Kammin	Gr. Stepenitz	1,600	8	5	50·0	31·2	62·5
	Usedom Wollin.	Wollin	4,967	10	3	20·1	6·2	30·0
	Naugard	Gollnow	8,472	11	9	13·0	10·6	82·0
Potsdam	Westprignitz	Havelberg	7,277	34	17	46·8	23·4	50·0
Gumbinnen	Tilsit	Tilsit	24,545	17	8	6·9	3·3	47·1

The outbreaks of cholera in 1893 have been made the subject of very careful study, and complete reports on the several districts have been issued.* As some of these have considerable etiological interest I propose to summarise some of the leading features.

In the Rhine district, Dr. Passow† recorded the occurrence of 27 cases of cholera. These he divides into three groups. The first group includes the cases (five in number) imported from abroad, one from the South of France and four from the Netherlands. The second group includes the cases (14 in number) attributed to the drinking of unfiltered Rhine water. Of these, 12 were said to have been caused by the drinking of water of the harbour at Ruhrort, and two by the drinking of Rhine water elsewhere. In this connexion it is worthy of note that

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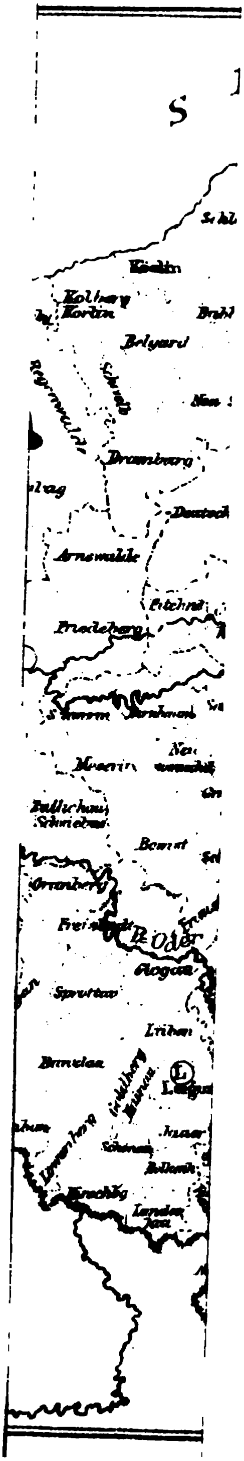
* Das Auftreten der Cholera im Deutschen Reiche, während des Jahres, 1893. Arbeiten aus dem Kaiserlichen Gesundheitsamte elfter Band, pp. 1–205. Berlin, 1894.

† Die Cholera im Rheinstromgebiete. Op. cit., pp. 6–22.

1893.


Kolberg
Korlin
Belgard
Dramburg
Arnswalde
Friedeberg
Meseritz
Züllichau
Schwiebus
Bomst
Grünberg
Freistadt
Oder
Glogau
Sprottau
Lüben
Bunzlau
Schönau
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Koch's comma bacilli were found in the water of Ruhrort Harbour on three occasions. The third group comprised the cases, eight in number, which were traced to direct infection from previous cases. Of this group, seven were connected with persons who had been attacked after drinking the water of Ruhrort Harbour, so that of the total 27 cases, 19 were traced, either directly or indirectly, to the use of Ruhrort Harbour water.

Dr. Frosch has reported in detail on the outbreak of cholera at Papiermühle and neighbourhood, near Solingen.* This outbreak comprised 20 cases and six deaths, which presented, clinically and bacteriologically, symptoms of cholera, and four cases which bacteriologically were indistinguishable from cholera, but which presented no other symptoms of the disease. The outbreak commenced on August 31st and terminated on September 12th. The nature of the disease was apparently not ascertained until September 4th, and it was in the majority of cases spread from person to person. The source of infection, in the first case, was not satisfactorily made out, although considerable suspicion was attached to the manipulation in a factory of some old ship's cables from Antwerp—a work upon which the man first affected had been exclusively employed.

The outbreak in Hamburg in the summer and autumn of 1893 which was investigated by Dr. Reincke,† will require a somewhat detailed consideration. The first case of cholera in Hamburg, in the summer of 1893, was reported to have occurred on May 27th when an employé in a shipping firm who had been suffering from diarrhœa for some days was attacked with cholera and died the same day. The source of the disease in this case was not traced. On June 17th a stoker employed on a steamship which had filled its tanks with unfiltered Elbe water, suffered from a slight attack of cholera, and on June 23rd another mild case occurred on board an English steamship lying in the harbour. After this no further cases were reported until the beginning of August, when a violent epidemic of diarrhœa broke out amongst the workmen employed at the Kuhwärder Dock on the south bank of the Elbe. At this dock some 3,000 workmen were employed, amongst whom, between August 8th and 11th, as many as 50 persons a day applied for diarrhœa medicine, and a large number were not treated medically at all. Reliable information was obtained as regards 110 cases—some of these were severe, but the majority recovered quickly. In 19 cases enteric fever developed later, and in one, on August 15th, the comma-bacillus was found. None of the workmen in the neighbouring docks or ships who obtained their water from the Hamburg supply or from springs were attacked. The water used by the workmen at Kuhwärder was taken from the Elbe at a point near the mouth of a drain into which the latrines at the docks discharged. The water was pumped to a tank situate at a height of three storeys, and then passed through a Bishop's patent filter. This filter, just prior to the outbreak, had been thoroughly cleansed and presumably its filtering power had, for the time being, been sensibly diminished. This appears to be borne out by the following results of observations made in the Hygienic Institute as to the presence of organisms in the filtered water :—

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* Die Cholera bei Solingen, von Dr. Frosch, assistent am Institute für Infections-Krankheiten. Op. cit., pp. 23-34.

† Die Cholera in Hamburg von Medicinalrath Dr. Reincke. Op. cit., pp. 39-71. And in Bericht des Medicinalrathes über die Medicinische Statistik des Hamburgischen Staates für das Jahr 1893, pp. 55-58.

Date.	Organisms in cubic centimeter.
November 21st 1892 - - - - - - -	1
„ „ „ (second sample) - - - - -	0
December 19th - - - - - - - -	2
February 6th 1893 - - - - - - -	3
March 3rd - - - - - - - -	8
August 24th - - - - - - - -	63

From August 16th tea was provided for the use of the workmen daily, and the use of the water was stopped after August 20th, from which date the water was obtained from the city supply. It should be noted that on July 19th bacilli suspicious of cholera were for the first time in 1893 found in the Elbe water. Soon after the outbreak of diarrhœa at Kuhwärder, three persons (one on August 23rd and two on August 25th) in the town, suffering from violent diarrhœa, were found to have cholera bacilli in their dejecta. On September 4th, 8th, 9th, 10th, 12th, 13th, and 15th, new cases of cholera were reported in Hamburg, gradually becoming more severe, but without fatal results until September 16th, except in the case of a sailor who, on September 7th, came to Hamburg from Rotterdam on the "Gallina." On September 16th, however, no less than nine persons, living in the most widely sundered parts of the city were attacked, and of these five died. On the 17th there were 16 cases, of which 4 died; on the 18th, 18 cases, of which 6 died, and so on on the following days up to September 21st. In these six days there were altogether 88 persons attacked, and of these 31 died. After this date the daily number of cases began to diminish. At the beginning of October there were days without any cases at all, and the last isolated case occurred on November 16th. From August 15th to November 16th, 126 persons were reported to have suffered from undoubted cholera, and of these 60, or 47·7 per cent. died. In addition to the above cases, the presence of Koch's comma bacillus was demonstrated in 76 other persons, who showed no other symptoms of cholera. In Table XVII. is given a daily record of the cholera cases and deaths reported from the 15th August to 16th November inclusive. The topographical position of the cases is shown in the annexed Map VIII.

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TABLE XVII.

DAILY RECORD of CHOLERA CASES and DEATHS during the SUMMER and AUTUMN of 1893 at HAMBURG.

[Numbers of persons in whose dejecta cholera bacilli found, but in whom no symptoms of cholera observed, are given in brackets.]

Day of Month.	Number of Cholera		Week ending	Number of Cholera		Day of Month.	Number of Cholera		Week ending	Number of Cholera	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
1893.			1893.			1893.			1893.		
Aug. 13	—	—	Aug. 19	(1)	—	Sept. 17	13 (3)	4	Sept. 23	65 (30)	31
„ 14	—	—				„ 18	11 (7)	6			
„ 15	— (1)	—				„ 19	10 (4)	5			
„ 16	—	—				„ 20	15 (2)	6			
„ 17	—	—				„ 21	8 (6)	5			
„ 18	—	—				„ 22	3 (2)	2			
„ 19	—	—				„ 23	5 (6)	3			
„ 20	—	—	„ 26	(3)	—	„ 24	5 (7)	2	„ 30	21 (23)	10
„ 21	—	—				„ 25	3 (7)	—			
„ 22	—	—				„ 26	2 (2)	2			
„ 23	— (1)	—				„ 27	5	4			
„ 24	—	—				„ 28	2 (4)	1			
„ 25	— (2)	—				„ 29	2 (2)	1			
„ 26	—	—				„ 30	2 (1)	—			
„ 27	—	—	Sept. 2	—	—	Oct. 1	—	—	Oct. 7	4 (2)	2
„ 28	—	—				„ 2	—	—			
„ 29	—	—				„ 3	—	—			
„ 30	—	—				„ 4	3	2			
„ 31	—	—				„ 5	1	—			
Sept. 1	—	—				„ 6	— (1)	—			
„ 2	—	—				„ 7	— (1)	—			
„ 3	—	—	„ 9	3 (2)	1	„ 8	— (1)	—	„ 14	7 (10)	4
„ 4	— (1)	—				„ 9	2 (1)	2			
„ 5	—	—				„ 10	1 (2)	—			
„ 6	—	—				„ 11	3 (4)	2			
„ 7	1	1				„ 12	—	—			
„ 8	— (1)	—				„ 13	1	—			
„ 9	1	—				„ 14	— (2)	—			
„ 10	2	—	„ 16	15 (2)	7	„ 15	1	—	„ 21	6 (1)	2
„ 11	—	—				„ 16	1	1			
„ 12	1	1				„ 17	1	1			
„ 13	2 (1)	1				„ 18	—	—			
„ 14	—	—				„ 19	—	—			
„ 15	2	—				„ 20	2	—			
„ 16	8 (1)	5				„ 21	1 (1)	—			

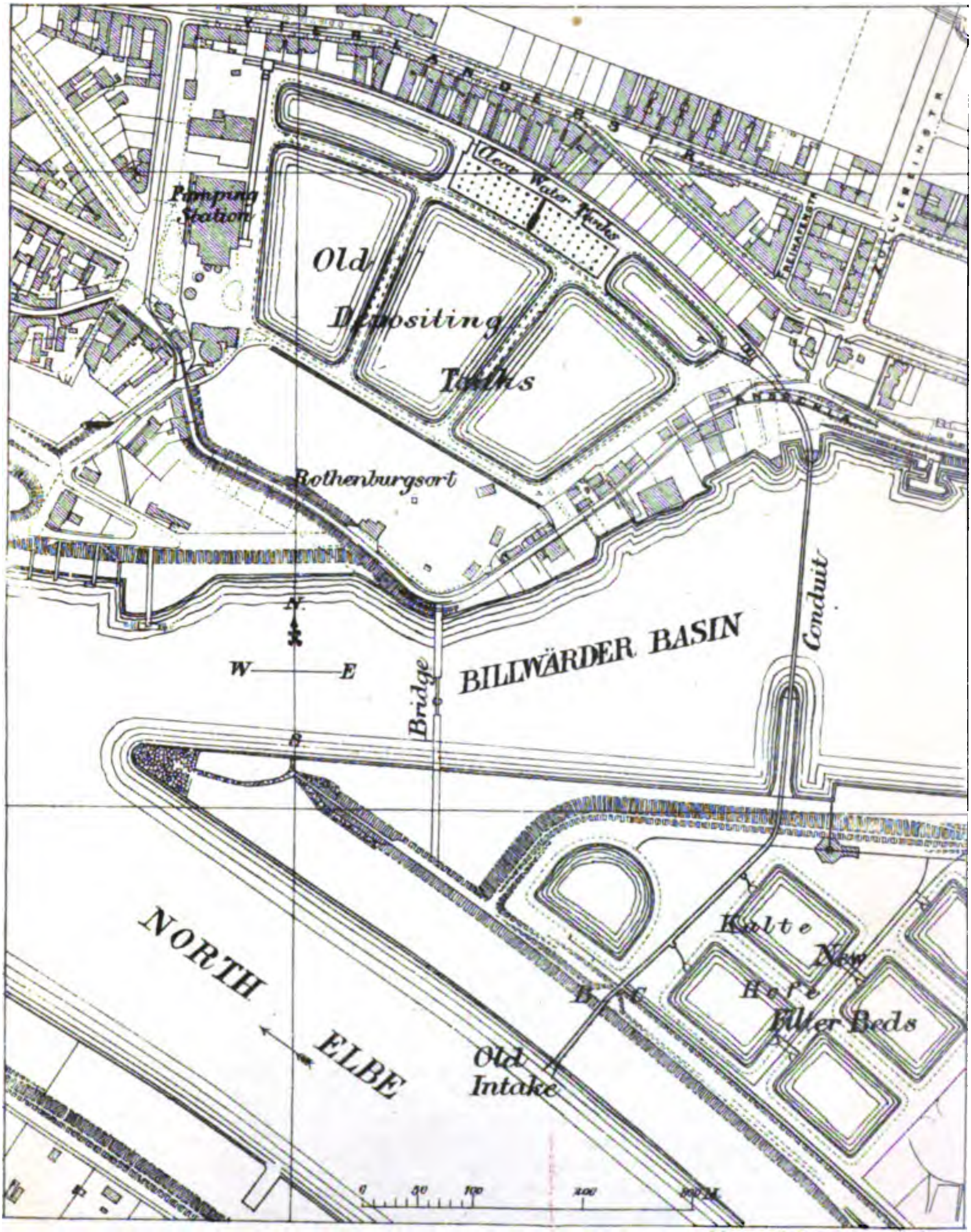
Day of Month.	Number of Cholera.		Week ending	Number of Cholera.		Day of Month.	Number of Cholera.		Week ending	Number of Cholera.	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
1893.			1893.			1893.			1893.		
Oct. 22 -	—	—	Sept. 28	3 (2)	2	Oct. 29 -	1	1	Nov. 4	2	1
„ 23 -	1	1				„ 30 -	—	—			
„ 24 -	—	—				„ 31 -	1	—			
„ 25 -	— (1)	—				Nov. 1 -	—	—			
„ 26 -	—	—				„ 2 -	—	—			
„ 27 -	1 (1)	1				„ 3 -	—	—			
„ 28 -	1	—				„ 4 -	—	—			
						„ 5–11 -	—	—	„ 11	—	—
						„ 16 -	1	—	„ 18	1	—
									Total -	126 (76)	60

In the majority of instances multiple cases were not observed in the invaded houses. Out of a total of 144 separate dwellings and ships invaded, in 18 only did more than one case occur. Of these, some may be referred to direct infection, as, for example, in the cases of attendants in the cholera wards of the general hospital and the anatomy servants in the same institution. Of the total number of cases, including the 76 which showed no clinical symptoms of cholera, 19 occurred on shipboard, in a floating population of 4,500 persons; whilst the remaining 183 cases were distributed in the town amongst a population of nearly 600,000, the proportional attack, according to population, being ten times as great on shipboard as on land. It was further observed that a considerable number of the cases were found in Neustadt, Sankt Pauli, and the northern part of Sankt Georg, that is to say, in those parts of the town high above the marshes. It is also noteworthy that Altona remained almost entirely, and Wandsbeck entirely, free, and that as regards Altona, as will be noted later, the majority of the cases were traceable to Hamburg. Further, as in 1892, there was a prevalence of enteric fever in Hamburg, which reached its height three weeks later than the cholera. This is illustrated in Table XVIII., which shows the number of cases of cholera and of enteric fever notified during each of the nine weeks ended November 4th.

Without discussing the origin of the isolated cases of cholera which occurred in Hamburg up to the middle of September, I propose only to refer to the special circumstances to which the outbreak, both of cholera and of enteric fever, in that month, were attributed, and in doing this I must refer in some detail to the water supply. Up to the end of May 1893, the water supply of Hamburg was taken from the Elbe at its old intake (*see* Map IX.), and was conveyed thence in a walled conduit across Kaltehofe, and then in a tunnel under the Billwärder basin to Rothenburgsort to the pumps, whence, unfiltered as it was, it was supplied to the town. Since that date it has been pumped at the new intake from the river at Billwärder Island, where the water is first passed into depositing tanks, and thence sent to Kaltehofe where it undergoes sand-filtration. The filtered water is collected in a clean-water conduit, which, as may be seen on reference to the plan, discharges at C into the old conduit, already referred to,

MAP IX.

Map of Hamburg Water Works Showing the positions respectively of the Old Depositing Tanks and the New Filter Beds, the position of the "Old Intake" and the Course of the Conduit there from.



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CHOLERA IN HAMBURG IN 1893.

Diagram shewing day by day during the period August to December 1893, the number of attacks & deaths recorded as due to Cholera at Hamburg (a); and the number of organisms found in water taken from the public water supply of Hamburg at the pumping station (b), at the Hygienic Institute (c), and at 25 Günther Strasse (d) respectively.

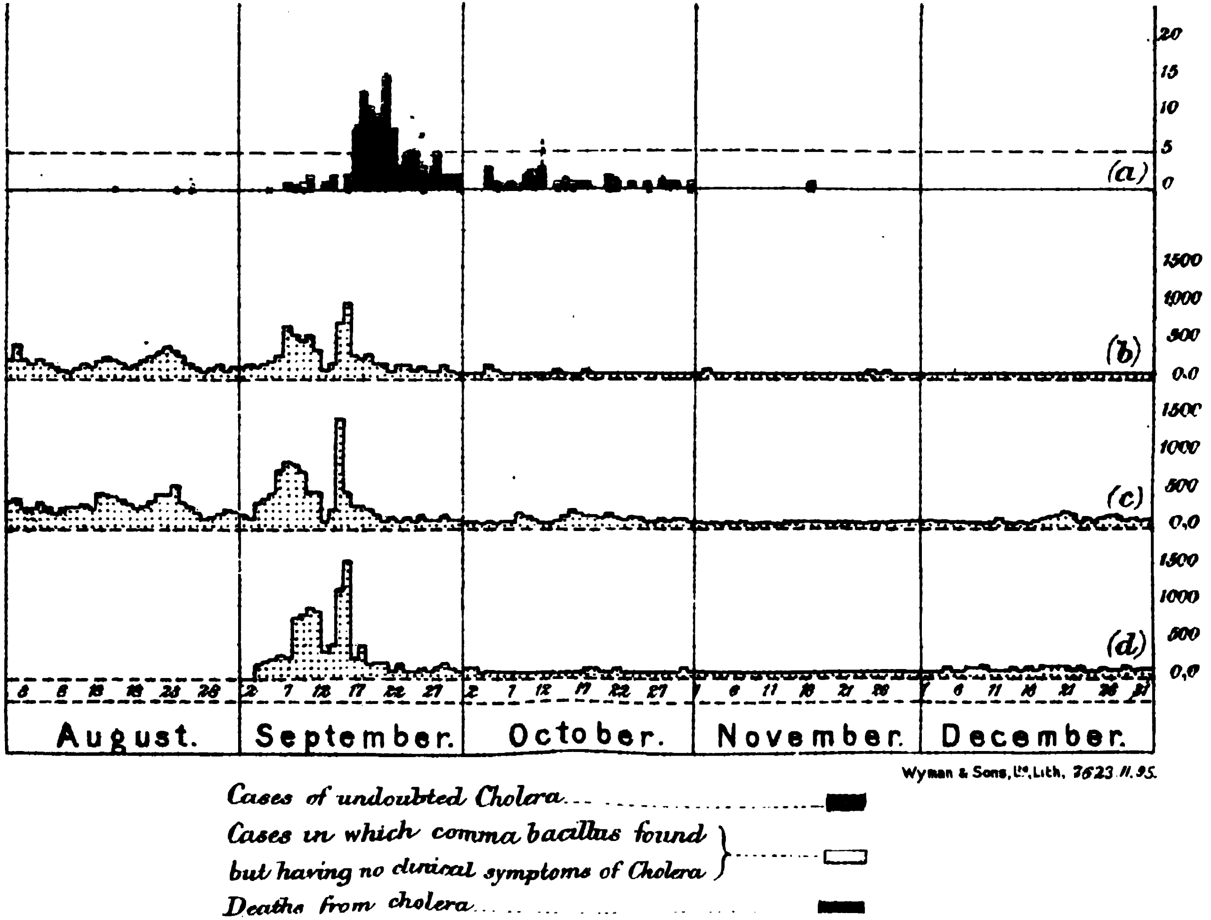

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TABLE XVIII.

Showing the Number of Persons reported as being Attacked by Cholera and by Enteric Fever respectively in each of the nine Weeks from September 3rd to November 4th, 1893.

Period.	Number of Persons reported to be attacked by	
	Cholera.	Enteric Fever.
From September 3–9 - - - - -	4	36
„ „ 10–16 - - - - -	17	68
„ „ 17–23 - - - - -	**95**	57
„ „ 24–30 - - - - -	44	55
„ October 1–7 - - - - -	6	77
„ „ 8–14 - - - - -	17	**91**
„ „ 15–21 - - - - -	7	51
„ „ 22–28 - - - - -	5	28
„ „ 28 to November 4 - -	2	19

which on its part is shut off from the Elbe by a sluice at B. The water from two filters only is discharged into the old conduit at points beyond C. From this conduit the water flows along the old course under the Billwärder basin to the clean-water reservoirs at Rothenburgsort, and so to the pumping station. Bacteriological examinations of the water were carried out at the Hygienic Institute at frequent intervals. Samples of water from each filter were examined, and also samples taken from the main conduit at C and at various other points in the course of its distribution to the town. It was found that whilst the filtered water at C contained a very limited number of organisms, it deteriorated in this respect along its further course. This increase in the number of organisms was, in the first instance, supposed to be due to impurities in the pipes, acquired when unfiltered water had been allowed to flow through them; but at the beginning of September a special increase in the number of organisms excited attention, and in consequence samples were taken at many more points, and it was proved that the fouling took place between the point C, where the water was discharged from the filters, and the pumping station at Rothenburgsort. In consequence of this, the Town Engineer, on September 15th, made special investigations on the spot, without any immediate result, until in the evening a watchman noticed a slight rotatory movement of the water near the sluice B, which appeared to indicate that there was some communication between the filtered water in the conduit and the Elbe outside. Further investigations made by a diver showed that, although the sluice was quite tight, a settlement had taken place in the masonry, which allowed communication between the Elbe and the filtered-water conduit. It was further ascertained that this settlement had only recently occurred. The defects in the masonry, so caused, were such as to allow, at flood tide, of the passage of unfiltered Elbe water into the conduit, whilst, on the other hand, at ebb tide, filtered water passed into the Elbe. Immediately after this discovery steps were taken to prevent the further pollution of the filtered water. In the annexed Diagram, in which the daily results of the bacteriological examinations are shown graphically, the marked decrease in the number of organisms, which at once followed, will be observed. The day after the officials had been engaged in looking for the source of the pollution of the water, cholera appeared suddenly in different parts of the city. Up to September 16th there had been, at most, two cases a day—on some days none at all, and now for six days there were, as has already been stated, from nine to eighteen cases a day. As regards these cases, it was ascertained that with respect to their sanitary circumstances they had but one in common, and that one the water-supply; and so also with regard to the outbreak of enteric fever, which occurred three weeks later. The distribution of these cases in Hamburg is shown graphically in Map VIII., and their occurrence, in point of time, in the annexed Diagram. It is to be noted that the presence of cholera-like bacteria was observed by Professor Dunbar in the Elbe water some time before the commencement of the first case in Hamburg. These organisms became more abundant, and later, when the epidemic was subsiding, more infrequent, whilst by the month of November they had entirely disappeared.

It yet remains to refer briefly to the outbreak in Altona. Here 14 cases of cholera only were observed in the autumn of 1893. Of the persons attacked four had been working in Hamburg on the south bank of the Elbe, and three in other parts of that city. Two originated in the Harbour, and one was an attendant at the Cholera Hospital, thus leaving only four cases in which no manifest connexion with Hamburg, or with previous cases, could be traced.

In the Elbe district, apart from Hamburg and Altona, the prevalence of cholera has been reported upon by Dr. Kohlstock.* From this report it appears that, altogether, 110 cases of reputed cholera were observed in the Elbe district, and that 13 of these showed no clinical symptoms of the disease. These 110 cases may be divided into three groups:—(*a*) includes those cases, 163 in number (5 of which displayed no clinical symptoms), attributed to the drinking of cholera-infected water; (*b*) includes the cases, 43 in number (8 of these displaying no clinical symptoms), in which the infection was conveyed by contact with cholera sick; and (*c*) those cases (4 in number) in which the origin of the sickness could not be traced. These groups are shown in the following Table XIX.:—

TABLE XIX.

Showing CLASSIFICATION of CHOLERA CASES observed in the ELBE VALLEY according to ALLEGED SOURCE of INFECTION.

Sex and Age.		Source of Infection attributed to			Total Cholera Attacks.
		Water.	Contact with previous Cases.	Not ascertained.	
Adults -	Males -	34 (3)	6	1	41 (3)
	Females -	19	13 (1)	2	34 (1)
Children	Males - -	4 (1)	12 (3)	—	16 (4)
	Females -	1 (1)	4 (4)	1	6 (5)
Totals -		58 (5)	35 (8)	4	97 (13)

Figures in brackets denote the number of cases in whose dejecta cholera bacilli were found, but who presented no clinical symptoms of cholera.

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* Die Cholera im Stromgebiete der Elbe. (Ausschliesslich Hamburg und Altona.) Von Dr. Kohlstock. Königl. Preussischem Stabsarzt beim Bezirks kommando I. zu Berlin. Op. cit., pp. 72–97.

Of the cases in which the source of the disease was attributed to water, the majority were adult men, whilst of those in Group (*b*), the principal number were women and children. Twenty-nine of the thirty-seven men who were said to have been infected by water were engaged on boats or rafts, and of the remainder all but one were members of the working classes. The principal centre of cholera in the Elbe district was at Havelberg, a town of 7,721 inhabitants, situate in the county of Westprignitz, where, between October 12th and 27th, 34 cases occurred, of which 17, or 50 per cent., died. Of these cases, 20, which occurred first in point of time, were attributed to the drinking of unfiltered Havel water, in which water the presence of Koch's comma-bacilli was demonstrated. The remaining cases at Havelberg appear to have been due to secondary infection.

Cholera in the Oder district has been reported on by Professor Pfeiffer,* from whose report the following notes are taken:—

The first case in the Oder valley was that of a man who had been engaged on September 15th and 16th in loading a barge with saltpetre taken from the Hamburg steamer "Frode." This man was attacked with violent diarrhœa on September 20th. His disease was not recognised as cholera, and his dejections were all thrown into the Oder. The barge was moored from September 15th to 23rd opposite the Zimmer Platz, in Stettin Harbour. Upon the latter date the barge was taken to Oberwieck, and remained there with another barge until September 24th, when the two together were taken by a steam tug up the Oder towards Küstrin. On September 24th typical symptoms of cholera supervened in the case of the man attacked by diarrhœa on September 20th, but it was not until the 27th, when the barge was stranded, owing to the lowness of the water opposite Alt Drewitz, in the district of Königsberg in Neumark, that medical assistance was called in and the disease recognised. This man died on September 29th. Up to the 27th inst. the whole of his dejections had been thrown into the Oder. On September 28th, a man on the barge which had accompanied the one already referred to, was also attacked, at Alt Drewitz, with cholera and died the same day. On September 23rd, the occurrence of a second primary case was recorded on board a barge in the Oder between Grabow and Bredow, situate below Stettin. On September 23rd two more cases occurred in the Dunzig, which forms part of the Stettin Harbour, and is a branch of the Oder. On September 24th another case was recorded in the Parnitz, which also forms a part of the Harbour, and is likewise an arm of the Oder.

On September 29th and 30th, Professor Pfuhl examined a number of samples of water from the most diverse parts of the Stettin Harbour, and in two samples the presence of Koch's comma-bacilli was demonstrated. Subsequently, between the beginning of October and the end of November, some 30 places in the Oder Valley were invaded by cholera, and upwards of 100 deaths took place. The chief centres of the disease were at Stettin, Warsow, Gartz, Gr. Stepenitz, Wollin, and Gollnow. To the outbreaks in Stettin, Gross Stepenitz, Wollin, and Gollnow, which are of especial etiological interest, I propose to refer briefly.

With respect to the outbreak at Stettin, the cases (87 in number) which occurred after October 4th, may be arranged in three groups: (*a*) a group consisting of 16 persons who, by the nature of their business as boatmen, harbour workmen, and the like, were employed on the Harbour, and who were all proved to have drunk unfiltered Oder water; (*b*) a group of 30 secondary cases in which cholera was passed directly

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* Die Cholera im Oderstromgebiete. Von Professor Dr. R. Pfeiffer, Vorstecher der wissenschaftlichen Abtheilung im Institute für Infections Krankheiten zu Berlin. Op. cit., pp. 98-132.

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from person to person: and (*c*) a group of 41 cases not connected with either of the above, but scattered throughout the town, and comprising persons of all classes and ages. Dr. Pfeiffer discusses in detail the various circumstances which might have been regarded as influencing the diffusion of cholera in Stettin, and he finally concludes that the water supply played an important part. The special circumstances of the water supply, to which he draws attention, may be summarised as follows:—

The Stettin waterworks, which were constructed in 1866, and which supply the town with filtered Oder water, are situate a little over a mile from the Harbour. The filters, which at the time of their construction in 1866 were only just sufficient for the needs of the town, had, owing to the growth of the population, become quite inadequate. This had been pointed out in 1892, and an extension of the filtering area had been decided upon, but the work had not been carried out owing to local difficulties. On September 13th the local authorities determined to have a bacteriological examination made of the filtered water weekly, and at a later date, when the epidemic supervened, the examination was made daily. In consequence of the comparatively small size of the filters, the work of filtration had to be performed with great rapidity, and that this led to most imperfect filtration is shown in Table XX., which gives the results of the bacteriological examinations, made on September 23rd and October 3rd, of the water after it had passed through each of the filters.

TABLE XX.

Showing the RESULTS of BACTERIOLOGICAL EXAMINATIONS of the STETTIN WATER SUPPLY, made on September 23rd and October 3rd, 1893.

Scurce of Water.	Number of Organisms found in each Cubic Centimetre of Water.	
	September 23rd.	October 3rd.
Filter A. - - -	Out of use for cleansing -	856
„ B. - - -	2,124	Out of use for cleansing.
„ C. - - -	14	5
„ D. - - -	1,051	Out of use for cleansing.
„ E. - - -	43	25
„ F. - - -	10	7
Water in reservoir drawn from all filters.	?	28
Unfiltered water - -	440	?

From the above table it will be seen that, as regards filters A., B., and D, the filtered water showed a larger amount of pollution than was contained in the water before it had been passed through the filters at all. In consequence of this examination the filtering material was, early in October, ordered to be changed, filters A. and B. being in the first instance declared to be unfit for use. A greater strain was thus thrown on the remaining filters, and on October 15th only two, C. and E., were in use, and it was manifestly impossible for these to perform the work efficiently. The finding of the cholera bacillus in the Oder water at the end of September has already been referred to, and on October 15th, in samples of water taken from the reservoirs of filters C. and D. the presence of Koch's comma-bacillus was demonstrated. After October 18th no cholera organisms were found in either the filtered or the unfiltered water, and it is noteworthy that only so long as cholera bacilli were contained in water which reached the filters of the Stettin Waterworks, were the scattered cases of cholera to be found within the area of the town water supply.

The cholera centre at Gross Stepenitz was formed in a little group of four houses situate some 20 minutes distance inland from Stepenitz. Here a child who had, accompanied by its mother, come for a visit from Ziegenort, was attacked with cholera on October 9th, and died on the following day. In the course of the following fortnight, seven other persons resident in this group of houses also suffered from cholera, and of these, four died. The water supply of these persons was ascertained to be of good quality, but in a small watercourse which passed between the houses, cholera bacilli were discovered in enormous quantities, and it was found that the soiled linen and clothing had been washed in this stream, and further that the water had been used for household purposes by the persons infected.

At Wollin, which is situated on the Dievenow, which conveys the Oder water from the Great Haff to the sea, a boy who had drunk much of the river water was attacked with cholera on October 25th, and on October 29th another case under similar circumstances occurred. Subsequently, between October 31st and November 4th, eight other persons living in various parts of the town, and having no connexion with the cases referred to above, also suffered from cholera. The whole of these eight cases were ascertained to have taken their water from the Lorenz Well, and this when examined was found to contain cholera bacilli. The well was closed on November 4th, and no further cases of cholera occurred. It was afterwards found that utensils which had contained the dejecta of a person who was suspected to have suffered from cholera between October 21st and November 1st had been washed in the well water.

The outbreak of cholera at Gollnow, which gave rise to eleven cases and nine deaths, occurred under somewhat similar circumstances to those referred to as having taken place at Wollin, except that here the first case was introduced from Stettin, and here the water used by the persons attacked was obtained from a mill pond, a brook, and a river all connected with each other, and all found to contain cholera bacilli.

According to the report of Dr. Friedheim* it would appear that five isolated cases only of cholera were recorded in the Weichsel and West Prussian districts. Of these, one came ill from Warsaw, and another was a doctor employed in examining cholera dejecta in the Bacteriological Laboratory at Danzig.

In the province of East Prussia, according to Dr. E. Von Esmarch,† although the province was bordered on two sides by provinces of Russia, which had been infected by cholera from the end of July, nine places only were invaded by cholera in 1893, and that in only one place, Tilsit, was a cholera centre formed. At this place 17 cases and nine deaths occurred between the 17th and 28th of October. All the cases here arose in a crowded tenement house situate outside the town.

Outbreaks of cholera in districts of Germany, other than those already referred to, have formed the subject of a report by Dr. Wutzdorff,‡ but in none of these was any noticeable cholera centre formed.

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* Die Cholera im Weichselstromgebiete und West-preussen. Von Dr. Friedheim Op. cit., pp. 133–153.

† Die Cholera in Ost-Preussen. Von Professor Dr. E. von Esmarch in Königsberg i. Pr. Op. cit. pp. 154–171.

‡ Sonst beobachtete, zerstreut vorgekommene Cholerafälle. Von Regierungsrath Dr. Wutzdorff. Op. cit., pp. 172–197.

In the foregoing account of the diffusion of cholera in the German Empire in 1893, I have described with a considerable amount of detail a number of small outbreaks in which water infection had apparently played a prominent part. This has been done on account, both of the etiological interest of these outbreaks, which from their limited character allowed of the most minute and exact inquiries being made, and also because the history of these outbreaks shows more than ever the paramount importance of the closest supervision being exercised over the water supply in times of cholera prevalence.

AUSTRO-HUNGARY.

The epidemic of cholera which existed in Austro-Hungary in 1892, and of which an account was given in my report for that year, had not at the end of the year entirely died out in certain departments of Galicia, or in the city of Budapest, and in dealing with the diffusion of cholera in the Empire in 1893, I propose, in the first instance, to give a short account of these cases, which must be considered as part of the 1892 epidemic, and then to deal with the summer prevalences of cholera in the (1) Hungarian, (2) Austrian, (3) Bosnian, portions of the Empire.

(*a*.) *Cholera attributed to Infection from* 1892.

(1.) *Austria.*

In January 1893 the only departments of Galicia in which cholera continued to prevail were those of Borszczow and Husiatyn, both situate near the River Zbrucz. In Table XXI. are given the numbers of cases and of deaths recorded in each town or village in the invaded departments during January and February. In Husiatyn, the last fatal case occurred on January 30th, whilst at Borszczow the disease appeared to have died down a week earlier, but at the end of February, a single case was notified, which terminated fatally on February 27th. From the Table it will be seen that up to the end of February, in eleven towns or villages of the invaded departments, there were 35 persons attacked by cholera, of whom 23 died.

TABLE XXI.

STATISTICS of CHOLERA recorded, January and February 1893, in certain DEPARTMENTS of GALICIA invaded in 1892.

Department. (Politische Bezirke.)	Town or Village.	Population.	Total recorded Cholera	
			Attacks.	Deaths.
Borszczow - -	Boryakowce - -	1,173	3	1
	Kudrynce - - -	2,601	8	5
	Nowosiolka - -	1,264	13	9
	Podfilipie - -	360	1	1
	Skala - - -	6,507	1	1
	Slobudka Turylecka -	389	2	-
	Wierzbówka -	562	2	2
	Zalucze - -	652	2	2
Husiatyn - -	Kociubince - -	2,492	1	1
	Siekierzynce	827	1	1
	Zielona - - -	702	1	-
	Totals -	17,559	35	23

In March and April a slight recrudescence of the disease took place. This commenced on March 18th, when a servant in the Finance Department, at Zalucze, in the Department of Borszczow, was attacked with symptoms suspicious of cholera, from which he recovered in a few days. The illness in his case was attributed to drinking water from the River Zbrucz. A week later two further persons resident in the same town were fatally attacked by cholera. On March 29th an outbreak occurred in the town of Kudrynce, which gave rise to 24 cases, of which 16 proved fatal. In a short time further cases occurred in seven other towns and villages of Borszczow, whilst in the Departments of Buczacz and of Tarnopol one imported case was certified in each. The total number of cases certified in 11 towns and villages situate in the three departments in March and April was 40, and of these 25 proved fatal. In Table XXII. is given the number of cases and of deaths which occurred in each place during this outbreak.

TABLE XXII.

STATISTICS of CHOLERA recorded in certain DEPARTMENTS of GALICIA in March and April 1893.

Department, (Politische Bezirke.)	Town or Village.	Date of first recorded Case of Cholera.	Population.	Total recorded Cholera	
				Attacks.	Deaths.
Borszezow	Zalucze	March 18	652	3	2
	Kudrynce	„ 29	2,601	24	16
	Nowosiolka	April 4	1,264	2	1
	Paniowce	„ 7	1,498	1	–
	Slobudka Turylecka	„ 9	389	4	2
	Zawale	„ 10	269	1	1
	Cygany	„ 10	2,022	1	1
	Losiacz	„ 15	2,019	1	1
	Podfilipie	„ 21	360	1	–
Buczacz	Buczacz	„ 23	11,096	1	1
Tarnopol	Smykowce	„ 23	754	1	–
	Totals		22,924	40	25

The total number of cases of cholera observed in Galicia in the early months of 1893 was 75, and of these 48 proved fatal. The cause of the second outbreak is somewhat obscure, but it is to be noted that several of the places invaded in March had been centres of cholera during the previous autumn.

(2.) *Hungary.*

The city of Budapest was the only place in Hungary in which cholera persisted beyond the end of 1892, and here, between January 1st and February 8th, 46 cases were recorded, of which 26 proved fatal.

(*b.*) *Cholera in Austro-Hungary attributed to new Importations of the Disease in* 1893.

(1.) *Hungary.*

According to the official report* upon cholera in Hungary, the first case occurred at the municipal town of Szatmár-Németi, situate on the

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* Hieronymi Károly Magyar Királyi Belügyminiszter. Jelentése az orszag Közegészségi Viszonyairól az, 1893—ik évben Budapest, 1894, pp. xxii.-xxxvi.

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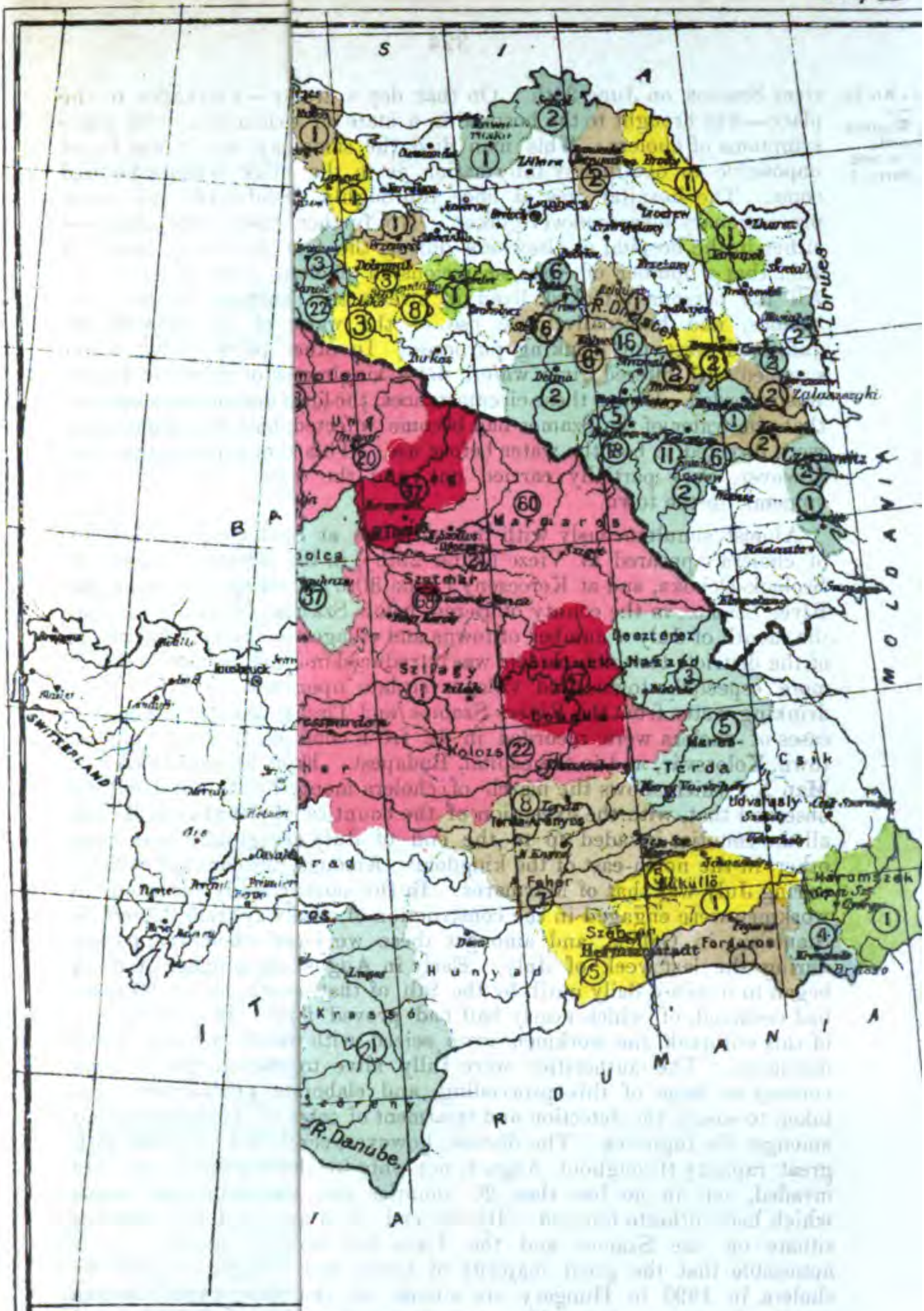
river Szamos, on June 24th. On that day a tramp—a stranger to the place—was brought to the hospital in a state of exhaustion, with grave symptoms of cholera. This man died the same day, and it was found impossible to obtain any information as to the place whence he had come. The hospital was at once thoroughly disinfected, and other precautionary measures were taken. No further cases were observed either in the hospital or elsewhere during the four following days, but after that a number of cases, suspicious of cholera, came under notice. All the persons attacked lived in streets that abutted on the River Szamos, and habitually made use of the water of the river in its unfiltered state for drinking purposes. In other parts of the town, supplied with filtered river water, not a single case of choleraic disease was recorded. Under these circumstances, the local authorities suspected that the water of the Szamos had become infected, and the inhabitants were directed to boil the water before use. This simple precaution was, however, very partially carried out, and the disease rapidly became epidemic in the town.

Almost simultaneously with the outbreak at Szatmár-Németi, cases of cholera appeared at Vicze (June 29th), in the adjacent county of Szolnok-Doboka, and at Kerecseny (June 30th), a village situate on the River Szamos, in the county of Bereg, below Szatmár-Németi. During the month of July a number of towns and villages in the neighbourhood of the districts to which cholera was introduced in June, became invaded, more especially towns and villages situate upon and receiving their drinking water from the Rivers Szamos and Tisza. During this month cases of cholera were recorded in 12 fresh counties, in one municipal town, Kolozsvár, and in the capital, Budapest. From an examination of Map X., which shows the march of cholera month by month, it will be observed that, with the exception of the counties of Nyitra and Tolna, all the counties invaded up to the end of July are situate near each other, in the north-east of the kingdom. Amongst the counties invaded during July was that of Mármaros. In this county many thousands of workmen were engaged in the construction of a railway from Szigeth to Stanislau, in Galicia, and amongst these workmen cholera appeared during the last week of July. Early in August the number of cases began to increase daily until, by the 9th of that month, about 80 cases had occurred, of which nearly half had proved fatal. In consequence of this outbreak, the workmen were seized with panic, and fled in all directions. The authorities were fully alive to the danger to the country at large of this proceeding, and elaborate precautions were taken to ensure the detection and treatment of cases of cholera occurring amongst the fugitives. The disease, however, continued to spread with great rapidity throughout August, not only in those counties already invaded, but in no less than 20 counties and six municipal towns which had hitherto escaped. By the end of August all the counties situate on the Szamos and the Tisza had become invaded. It is noticeable that the great majority of towns and villages attacked by cholera in 1893 in Hungary are situate on the waterways. Cholera continued to spread in Hungary during September, October, and November, although with much less rapidity than in August, and the epidemic finally died out in December, the last case being recorded on December 24th.

Of the total 63 counties in Hungary only 10 escaped invasion in 1893, and of the 26 municipal towns 16 were invaded.

In Table XXIII. are given the statistics of cholera in the several counties and municipal towns of Hungary during 1893.



Departments
-vaded during Map shewing the March of Cholera
June.......... month by month in Austro-Hungary
July.......... in 1893.
August..........
September.... number of Communes in each County or De-
October.......... ment invaded is indicated by figures in
November &. es e.g. ⑫

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TABLE XXIII.

Statistics of the Cholera Epidemic recorded in the several Counties and Municipal Towns of Hungary during 1893.

County or Municipal Town.	Date of first recorded Case of Cholera, 1893.	Number of Communes invaded by Cholera.	Population.	Total recorded Cholera		Rates per 10,000 of the Population. Cholera		Percentage of Deaths to recorded Attacks "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Szatmár-Németi	June 24 -	1	20,736	102	54	49·2	26·0	52·9
Szolnok-Doboka -	June 29 -	47	217,550	376	243	17·3	11·2	64·7
Bereg - -	June 30 -	37	179,455	320	187	17·8	10·4	58·5
Szatmár - -	July 4 -	63	303,032	504	301	16·6	9·9	59·7
Nyitra - -	July 7 - -	10	396,559	41	24	1·0	0·6	59·9
Hajdú - -	July 7 -	1	134,038	17	7	1·3	0·5	41·2
Ugocsa - - -	July 12 -	21	75,461	156	83	20·7	11·0	53·2
Zemplén - -	July 15 -	18	299,197	388	147	13·0	4·9	37·9
Kolozs - -	July 20 -	22	192,443	81	61	4·2	3·2	75·3
Kolozsvár -	July 21 -	1	35,930	209	128	58·2	35·6	61·2
Budapest - -	July 22 -	1	491,933	183	109	3·7	2·2	59·6
Mármaros - -	July 24 -	60	268,281	1,528	728	57·0	27·2	47·7
Ung - - -	July 27 -	20	135,247	124	85	9·2	6·3	68·5
Szilágy - -	July 29 -	1	191,167	7	5	0·4	0·3	71·5
Bihar - - -	July 31 -	2	478,147	17	8	0·4	0·2	47·2
Borsod - -	July 31 -	9	216,794	28	17	1·3	0·8	60·7
Tolna - - -	July 31 -	6	252,098	9	3	0·4	0·1	33·3
Jász-Nagy-Kún-Szolnok.	August 1 -	30	318,475	525	309	16·5	9·7	58·8
Szabolcs - -	August 1 -	37	244,945	514	232	21·0	9·5	45·1
Csongrád - -	August 2 -	10	164,340	183	127	11·1	7·7	69·5
Zolyom - -	August 2 -	2	112,413	2	1	0·2	[0·1]	—
Heves - -	August 3 -	10	233,785	158	63	6·8	2·7	31·8
Pest-Pilis-Solt-Kis-Kún.	August 3 -	41	684,298	95	68	1·4	1·0	71·6
Vas - -	August 3 -	3	390,371	5	3	0·1	0·1	—
Somogy - -	August 6 -	2	326,835	2	1	0·06	[0·03]	—
Bars - - -	August 8 -	3	152,910	8	2	0·5	0·1	—
Szeged - -	August 8 -	1	85,569	46	37	5·4	4·3	80·5
Beszterczе-Naszód	August 9 -	3	104,737	24	8	2·3	0·8	33·3
Selmecz és-Béla-bánya.	August 10 -	1	15,280	2	1	1·3	[0·7]	—
Torontál - -	August 11 -	20	570,802	367	232	6·4	4·1	63·2
Kis-Küküllö -	August 12 -	5	101,045	31	20	3·1	2·0	64·5
Maros-Torda -	August 12 -	5	163,648	15	11	0·9	0·7	73·3
Maros-Vásárhely	August 15 -	1	14,212	1	1	[0·7]	[0·7]	—
Fejér - -	August 16 -	11	194,907	34	23	1·7	1·2	67·7
Bács-Bodrog -	August 17 -	31	573,114	277	194	4·8	3·4	70·0

County or Municipal Town.	Date of first recorded Case of Cholera, 1893.	Number of Communes invaded of Cholera.	Population.	Total recorded Cholera		Rates per 10,000 of the Population. Cholera		Percentage of Deaths to recorded Attacks. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
DEBRECZEN -	August 18 -	1	56,940	6	4	1·1	0·7	—
Békés - -	August 19 -	5	258,386	48	29	1·9	1·1	60·4
Brassó - -	August 20 -	4	86,777	29	22	3·3	2·5	75·9
KECSKEMÉT -	August 23 -	1	48,493	2	2	0·4	0·4	—
Moson - -	August 24 -	3	85,050	14	9	1·6	1·1	64·3
Árva - - -	August 29 -	3	84,820	12	9	1·4	1·1	75·0
Krassó-Szörény -	August 29 -	1	407,635	3	2	0·07	0·05	—
HÓDMEZÖVÁSÁRHELY. -	August 31 -	1	55,475	3	3	0·5	0·5	—
Baranya - -	September 1	5	288,218	34	17	1·2	0·6	50·0
Veszprém - -	September 1	2	215,280	2	—	0·1	—	—
ARAD - -	September 1	1	42,052	1	1	[0·2]	[0·2]	—
Gömör-Kishout -	September 3	2	174,810	2	2	0·1	0·1	—
Alsó-Fehér - -	September 4	7	193,072	24	19	1·2	1·0	79·1
UJVIDEK - -	September 9	1	24,717	2	2	0·8	0·8	—
Fogaras - -	September 10	1	88,217	2	2	0·2	0·2	—
Torda Aranyos -	September 12	8	150,564	74	54	4·9	3·6	73·0
Sáros - -	September 17	7	168,021	20	14	1·2	0·8	70·0
Zala - - -	September 30	2	404,699	2	—	0·05	—	—
Pozsony - -	October 2 -	1	278,959	1	1	[0·04]	[0·04]	—
Liptó - - -	October 3 -	2	76,850	19	12	2·5	1·6	63·2
Esztergom - -	October 4 -	3	78,378	3	2	0·4	0·3	—
Szeben - - -	October 4 -	5	148,738	11	9	0·7	0·6	82·0
Nagy-Küküllö -	October 15 -	1	135,312	1	1	[0·07]	[0·07]	—
Szepes - - -	October 15 -	2	168,291	12	5	0·7	0·3	41·7
Komárom - -	October 16 -	4	146,428	9	8	0·6	0·5	—
KOMÁROM - -	October 16 -	1	13,076	9	8	6·9	6·1	—
BAJA - -	October 16 -	1	19,485	5	1	2·6	[0·5]	—
Györ - - -	October 17 -	3	92,992	4	4	0·4	0·4	—
SZÉKES-FEHÉRVÁR	October 27 -	1	27,548	2	2	0·7	0·7	—
Hont - - -	October 28 -	1	107,743	1	1	[0·1]	[0·1]	—
PÉCS - -	October 28 -	1	34,067	2	1	0·6	[0·3]	—
Háromszék -	November 6	1	130,008	8	2	0·6	0·1	—
TEMESVÁR -	November 7	1	39,884	2	—	0·5	—	—
Trencsén - -	November 8	1	258,769	3	2	0·1	0·1	—
Hungary - -	- - -	634	12,924,513	6,753	3,773	5·2	2·9	56·0
Counties - -	- - -	618	11,899,111	6,176	3,419	5·2	2·9	55·4
Municipalities -	- - -	16	1,025,402	577	354	5·6	3·5	61·4

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From Table XXIII. it will be seen that, in Hungary, in 1893, 618 towns and villages, situate in 53 counties, were invaded by cholera; that the total number of attacks was 6,753, of which 3,773, or 56 per cent., were fatal. These figures are equivalent to an attack rate of 5·2, and a death rate of 2·7 per 10,000, of the aggregate population living in the invaded counties.

Considerably more than one-fifth of the total cases and deaths occurred in the county of Mármaros, where 1,528 cases and 728 deaths were recorded, and in this county 60 communes were invaded. In the county of Szatmár 68 communes were invaded, but the incidence of the disease was not so great as in Mármaros, the total cases and deaths being 606 and 355 in number respectively.

As already stated, the cholera epidemic in Hungary, in 1893, commenced on June 24th, and from that date to the end of the month five cases, three of which were fatal, were recorded in three counties. During July the disease invaded 12 new counties, and the daily number of cases gradually increased; in August the epidemic changed its character, the cases rapidly increasing in number until August 28th, or 66 days after the appearance of the first case, when the epidemic reached its maximum, 237 new cases being cases notified on that day. From August 28th the daily number of cases rapidly declined in number, and on September 11th the occurrence of only 19 new cases was reported. From this date the epidemic remained practically stationary until the end of October, when a further decline in the daily number of cases took place, until it finally died out in December, the last case, as already stated, being notified on the 24th of that month. The average number of cases per day was, in July, 7; in August, 66; in September, 24; in October, 18; and in November, 4. The case mortality or "fatality" was in June, 57·1; July, 56·7; August, 50·2; September, 64·9; October, 69·2; November, 62·7; and December, 70·9 per cent. respectively.

The great majority of the cases and deaths are stated to have occurred amongst the poorest classes, navvies, workmen, agricultural labourers, domestic servants, and the like. In the county of Bereg the incidence of the disease was greatest on raftsmen and fishermen. Amongst the well-to-do classes the disease attacked comparatively few persons. Of persons who by their calling had necessarily to come into contact with cholera patients and their belongings—physicians, nurses, disinfectors, &c.—66 suffered from cholera, and of these 22 died.

The chief centres of cholera in Hungary in 1893 are given in Table XXIV. (p. 62), and from the figures some idea of the intensity of the disease may be obtained. As to the special circumstances of the places in which the disease prevailed no *data* have been received in this country.

The preventive measures adopted by the Hungarian Government, of which a detailed account is given in the official report already referred to, may be divided into six groups.

1. Arrangements for securing the early diagnosis of cases of cholera. These embraced the compulsory notification of the occurrence of suspicious cases, and the bacteriological examination of dejecta.

2. The regulation of river traffic and the promotion of measures of domestic cleanliness. In this connexion, special arrangements were made to secure the substitution of filtered water for water drawn directly from rivers or from other sources liable to pollution.

3. The medical examination of all persons crossing the frontier, in order to secure the detention and isolation of persons arriving in the

TABLE XXIV.

Showing the several Towns and Villages situate in Hungary in which Ten or more Deaths from Cholera were recorded in 1893.

County.	Town or Village (Municipal Towns in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Number of recorded Cholera		Rate per 10,000 Population. Cholera		Deaths per Cent. recorded Attacks. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
	SZATMÁR-NÉMETI	June 24	20,736	102	54	49·2	26·0	52·9
Szolnok-Doboka.	Deés - -	July 4	7,728	30	28	38·8	36·2	93·3
	Szász-Nyires -	July 8	1,200	34	20	283·3	166·7	58·8
	Alsó-Hagymás -	July 16	768	18	11	234·4	143·2	61·1
	Kis-Kaján -	July 22	786	53	28	675·0	356·2	52·8
	Nagy-Kaján -	July 28	592	19	12	321·0	202·8	63·2
	Szamos-Ujvár -	Aug. 6	5,793	16	14	27·6	24·2	87·5
	Semesnye - -	Aug. 8	1,408	35	23	248·5	163·2	65·6
Bereg	Tisza-Kerecseny -	June 30	1,241	25	15	201·4	120·9	60·0
	Vásáros-Namény -	July 13	1,501	34	20	226·5	133·0	58·8
	Tisza-Szalka -	July 20	1,213	23	13	189·6	107·4	56·5
	Tisza-Adony -	July 26	854	15	10	175·6	117·0	66·6
	Hátmeg - -	Aug. 1	1,421	17	14	119·6	98·5	82·3
	Nágy-Lónya -	Aug. 14	1,341	24	11	179·0	82·1	45·8
	Munkács - -	Sept. 4	10,531	17	14	16·1	13·3	82·3
Szatmár	Szamosbecs -	July 4	2,213	40	23	180·8	104·0	57·4
	Panyola - -	July 9	1,387	19	10	137·0	72·1	52·6
	Erdőszáda -	July 18	1,288	19	13	147·4	101·0	68·4
	Szamos-Ujlak -	July 25	291	26	12	893·0	412·5	46·2
	Kér - -	July 29	838	21	12	250·5	143·2	57·1
	Cseke - - -	July 30	1,824	21	14	115·0	76·8	66·6
	Szamosszeg -	Aug. 4	2,213	40	23	180·6	104·0	57·5
	Oláh-Tótfalu -	Aug. 20	632	18	10	285·0	158·2	55·6
	Nagybánya - -	Aug. 23	9,838	32	16	32·5	16·2	0·0
	Bujánháza -	Aug. 25	735	20	15	272·0	204·0	75·0
Ugocsa	Gödényháza -	Aug. 4	715	45	17	629·0	238·0	37·8
	Nagy-Tarna -	Aug. 12	1,458	36	16	247·2	110·0	44·4
Zemplén	Tőke-Lucs -	July 15	2,257	49	20	217·0	88·6	40·8
	Nagy-Tárkány -	July 28	1,007	31	15	308·0	149·0	48·4
	Kis-Czigánd -	July 29	1,743	80	28	459·0	160·5	35·0
	Nagy-Czigány -	July 29	1,440	90	29	625·0	201·4	32·2
	Karád - -	Aug. 5	2,169	69	10	318·0	46·1	14·5
	Nagy-Mihály -	Sept. 11	4,502	29	17	64·4	37·7	58·7
Kolozs	Bonczhida -	July 29	1,942	25	15	128·8	77·3	60·0

County	Town or Village (Municipal Towns in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Number of recorded Cholera		Rate per 10,000 Population. Cholera		Deaths per Cent. of recorded Attacks. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
	KOLOZSVAR -	July 21	35,930	209	128	58·2	35·6	61·2
	BUDAPEST -	July 23	491,938	183	109	3·7	2·2	59·6
Mármaros	Kis-Lonka és Kuzi	July 24	1,945	105	34	540·0	174·8	32·4
	Körösmező -	July 25	7,620	175	84	229·6	110·6	48·1
	Mármaros-Sziget -	July 27	14,758	47	30	31·8	20·3	63·8
	Dulfalva - -	July 29	1,079	46	26	426·3	241·0	56·5
	Borkút - - -	July 31	832	52	28	625·0	336·5	53·9
	Rahó - -	July 31	5,767	243	102	421·5	176·9	42·0
	Trebusa - Fejérpatak.	Aug. 1	1,881	167	64	888·0	340·0	38·3
	Nagy-Bocskó -	Aug. 2	4,538	177	61	390·0	134·4	34·5
	Visk - - -	Aug. 5	4,054	19	14	46·9	34·5	73·7
	Talaborfalva -	Aug. 7	2,099	31	21	147·6	100·0	67·8
	Técső - -	Aug. 9	3,733	16	11	42·8	29·4	68·8
	Sajó-Polyána -	Aug. 23	941	76	44	808·0	467·5	57·9
	Közép-Apsa -	Aug. 24	2,700	38	17	140·8	62·9	44·8
	Gánya - - -	Oct. 1	1,799	16	12	88·9	66·7	75·0
	Pilipecz - - -	Oct. 1	605	53	11	876·0	182·0	20·8
	Mojszén - -	Oct. 8	2,903	34	20	117·2	69·0	58·9
Ung - -	Ungvár - -	Aug. 26	11,793	49	37	41·6	31·4	75·5
	Satrajnyán - -	Oct. 10	1,497	15	11	100·1	73·5	73·4
Jász-Nagy-Kún-Szolnok.	Szolnok - - -	Aug. 1	20,748	197	127	95·1	61·3	64·5
	Kötelek - -	Aug. 8	2,378	42	28	176·4	117·5	66·6
	Nagy-Körü - -	Aug. 8	2,636	25	14	94·8	53·1	56·0
	Tisza-Szajol - -	Aug. 8	1,241	66	31	532·0	250·0	47·0
	Tisza-Ug - -	Aug. 10	919	11	11	119·6	119·6	100·0
	Tisza-Szalók -	Aug. 14	3,820	29	13	75·9	34·0	44·9
	Tisza-Kürt -	Aug. 24	2,915	15	11	51·5	37·7	73·4
	Török - Szent - Miklós.	Sept. 6	18,772	11	11	5·9	5·9	100·0
Szábolcs -	Eszeny - - -	Aug. 1	1,626	56	18	344·5	110·8	32·2
	Veresmart - -	Aug. 1	1,260	14	10	111·2	79·4	71·4
	Tuzsér - -	Aug. 5	1,120	25	10	223·5	89·3	40·0
	Zsurk - - -	Aug. 5	896	72	17	803·0	189·8	23·6
	Dombrád - -	Aug. 7	3,913	83	40	212·0	102·2	48·2
	Kis-Várda - -	Aug. 7	6,458	32	22	49·6	34·1	68·7
	Karász - - -	Aug. 14	2,023	42	19	208·0	94·0	45·2
	Ibrony - -	Aug. 15	848	26	12	306·5	142·2	46·2
Csongrád -	Mindszent - -	Aug. 2	12,083	87	62	72·3	51·3	71·2
	Csongrád - -	Aug. 11	20,802	57	40	27·4	19·2	70·2
	Tápé - - -	Aug. 13	2,884	15	10	52·0	34·7	66·6

County.	Town or Village (Municipal Towns in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Number of recorded Cholera		Rate per 10,000 Population. Cholera		Deaths per cent. of recorded Attacks. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Heves	Tisza Füred	Aug. 3	8,024	11	10	*13·7*	*12·5*	*90·9*
	Sarud	Aug. 8	2,804	81	23	*289·0*	*82·3*	*28·4*
	Tisza-Nána	Aug. 8	4,356	40	14	*91·8*	*32·2*	*35·0*
	SZEGED	Aug. 8	85,569	46	37	*5·4*	*4·3*	*80·4*
Torontál	Melencze	Aug. 29	8,691	43	28	*49·5*	*32·2*	*65·1*
	Antalfalva	Sept. 2	4,271	23	18	*53·8*	*42·2*	*78·2*
	Csóka	Sept. 12	3,330	14	11	*42·1*	*33·0*	*78·7*
	Farkasd	Oct. 7	2,014	91	45	*452·0*	*223·5*	*50·5*
	Basahid	Oct. 18	4,192	35	26	*83·5*	*62·1*	*74·3*
	Lajosmajor (tauya).	Oct. 21	112	29	14	*2590·0*	*1250·0*	*48·3*
	Ernesztháza	Oct. 22	2,120	16	10	*75·5*	*47·2*	*62·5*
Bács-Bodrog	Zenta	Aug. 17	25,725	24	17	*9·3*	*6·6*	*70·9*
	O'-Becse	Aug. 18	16,965	70	45	*41·3*	*26·5*	*64·2*
	Mohol	Aug. 20	9,509	30	22	*31·5*	*23·2*	*73·4*
	Petrovoszelló	Aug. 22	8,616	39	24	*45·3*	*27·8*	*61·5*
	Ada	Aug. 27	11,074	13	13	*11·8*	*11·8*	*100·0*
	Csurogh	Aug. 28	7,773	34	26	*43·8*	*33·4*	*76·5*
Békés	Orosháza	Aug. 19	19,956	41	22	*20·5*	*11·0*	*53·7*
Brassó	Brassó	Aug. 20	30,739	26	19	*8·5*	*6·2*	*73·1*
Baranya	Pécsvárad	Oct. 19	3,016	29	13	*96·1*	*43·1*	*44·8*
Alsó-Fehér	Maros-Gezso	Sept. 4	1,067	15	10	*140·6*	*93·7*	*66·6*
Torda-Aranyos	Maros-Bogát	Sept. 19	2,486	42	28	*168·8*	*112·7*	*66·6*
	Maros-Ludas	Sept. 20	2,393	15	13	*62·7*	*54·3*	*86·7*
Liptó	Csernova	Oct. 7	1,289	17	11	*131·8*	*85·3*	*64·7*

country suffering from illness suspicious of cholera, and the disinfection of their effects.

4. The regulation of the traffic between "infected" and "non-infected" places in the country. Under this heading arrangements were made to secure the medical examination of persons leaving "infected" places, the disinfection of soiled clothing and linen, the notification of passengers' intended arrival to the authorities at their places of destination. At the same time, in the "infected" districts all schools were to be closed, and the holding of fairs, church festivals, or other gatherings, were to be forbidden.

5. Measures for limiting the spread of the disease in places where it occurred. These included the isolation of persons suffering from cholera, the disinfection of their effects, and the speedy burial of the dead. As regards the carrying out of these measures, considerable difficulty arose in the rural districts, for the country people objected most strenuously to the removal of infected persons from their homes to hospitals, and in practice it was found easier to dislodge the healthy than the sick, and to tend the latter in their infected houses. It there-

fore frequently happened that the hospitals provided did not contain a single patient, but were peopled by healthy persons brought there from their homes. Similar difficulties were experienced in carrying out the speedy burial of the dead, and in a good many instances the authorities had to employ force before the regulations could be carried out. The necessity for these measures was especially observed in the counties of Mármaros and Torontál, in the former of which many cases of cholera were traced to the incautious handling of corpses, while in the latter outbreaks were attributed to the ceremonies and festivities in connexion with funerals.

6. The provision of medical assistance and of special hospital accommodation. During the time of the epidemic 155 special cholera physicians were employed, and of these the majority were paid by the State. Hospital accommodation was also provided at the cost of the State for persons living away from their own homes, and for the homeless—for example, domestic servants, travellers, tramps, and the like. Of the total number of cholera patients, 997, or only 14·7 per cent., were treated in hospital, it having been found, as stated above, easier to take the healthy there than the sick.

The measures to which the decline of the epidemic was locally attributed, were the cutting off of river waters as sources of supply, especially those of the Szamos and the Tizsa, the prevention of the customary visiting of the dead, and the stoppage of the raft traffic on the Tisza.

The statistics of cholera in the several towns and villages of Hungary are given in Table B (2) appended to this report, and the relative mortality from cholera in the several counties and municipal towns is shown graphically in Map XI.

(2.) *Austria.*

No complete account of cholera in Austria in 1893 has as yet been officially published, and in the following very brief account I have been compelled to make use of the notes which were published from time to time during the progress of the epidemic in the official organ of the Sanitary Council of the Austrian Empire.* Through the kindness of Dr. J. Daimer, the Secretary of the Sanitary Council, I am, however, able to give complete statistics of the epidemic in Austria in 1893.

After the outbreak of cholera in March and April in the Galician Departments of Borszczow, Buczacz, and Tarnopol, to which reference has already been made in this report, the Austrian portion of the Empire remained free from the disease for many weeks, no new case being reported until the first week of August. During the week ending August 7th, the three Departments of Nadwórna, Rawa-ruska and Kolomea, all situate in Eastern Galicia, were invaded. The first cases in Nadwórna and Kolomea were traced to workmen returning from the infected county of Mármaros in Hungary. In Rawa-ruska one isolated case occurred at Belzec, a village situate close to the Russian frontier. During the second week of August cholera was introduced to places situate in the Departments of Sniatyn and Limanowa as well as to several fresh towns and villages in the Departments of Nadwórna and Kolomea, by navvies from Hungary. On August 8th, 210 Italian workmen on their way home from the infected districts of Hungary passed through the province of Steiermark, and on reaching St. Georgia, in the Department of Cilli, one of them was found to be suffering from symptoms suspicious of cholera. He was taken to a hospital, where he died; and from the bacteriological examination the presence of cholera was confirmed, but no further extension took place in this Department.

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* Das Oesterreichische Sanitätswesen. Organ für die Publicationen des K. K. Obersten Sanitätsrathes. Redigirt von Dr. J. Daimer. Schriftführer des Obersten Sanitätsrathes. V. Jahrgang. Wien, 1893.

From the cholera centres formed in Galicia the disease spread with great rapidity, and by the end of August 18 Departments in Galicia, as well as the city of Krakow, became infected. The epidemic continued to spread during the following month, during which 10 more Departments were invaded. After the end of September it gradually declined, but even up to the beginning of December new districts were attacked, and the disease had not entirely died out until December 31st. In the province of Galicia, from August 3rd to December 31st, 1893, cases of cholera were recorded in 36 Departments and in one City.

Beside the province of Galicia and Steiermark, the appearance of cholera was confirmed at Czernowitz, in the province of Bukowina, on August 16th, and in the city of Vienna, in the province of Nieder Oesterreich, on August 22nd. In neither case was there any serious outbreak. In Bukowina cases were notified from three departments besides Czernowitz, but the total number of attacks during the whole epidemic only amounted to 20 (10 fatal.) In Vienna four cases only were recorded. The origin of cholera in Bukowina was not satisfactorily settled, but it was locally attributed to the drinking of the infected water of the River Pruth. In Table XXV. will be found a list of the departments in the Austrian portion of the Empire invaded by cholera in the autumn of 1893, with the date of the first recorded case in each, the number of places invaded in each department, with the number of attacks and deaths, together with the ratio which these bore to the population respectively.

From an examination of Map X. it will be observed that, with the exception of two or three departments situate on the Russian frontier, nearly the whole of the early invaded departments of Galicia adjoined the Hungarian frontier.

TABLE XXV.

STATISTICS of CHOLERA in the several DEPARTMENTS (POLITISCHE BEZIRKE) of AUSTRIA invaded during the period August 3rd to December 31st, 1893.

Province.	Departments. (Politische Bezirke.)	Date of first recorded Case of Cholera, 1893.	Population. (Census 1890.)	Places invaded.	Number of recorded Cholera		Rates per 10,000 of the Population. Cholera		Deaths per-centage of recorded Attacks. "Fatality."
					Attacks.	Deaths.	Attacks.	Deaths.	
	Nadwórna - -	Aug. 3	71,496	18	464	286	*64·9*	*40·0*	*61·7*
	Rawa-ruska -	" 5	95,110	1	1	1	[*0·1*]	[*0·1*]	—
	Kolomea - -	" 7	131,073	11	149	80	*11·4*	*6·8*	*59·7*
	Sniatyn - -	" 8	76,065	6	20	17	*2·6*	*2·2*	*85·0*
	Limanowa -	" 12	73,239	3	6	3	*0·8*	*0·4*	*50·0*
	Brzesko - -	" 15	90,748	6	22	7	*2·4*	*0·8*	*31·8*
	Krakau (city) -	" 16	74,593	1	9	7	*1·2*	*0·9*	*77·9*
	Sokal - -	" 16	90,025	2	2	2	*0·2*	*0·2*	—

Province.	Departments. (Politische Bezirke.)	Date of first recorded Case of Cholera, 1893.	Population. (Census 1890.)	Places invaded.	Number of recorded Cholera		Rates per 10,000 of the Population., Cholera		Deaths per-centage of recorded Attacks. "Fatality."
					Attacks.	Deaths.	Attacks.	Deaths.	
Galizien -	Horodenka - -	Aug. 19	86,047	1	16	12	*1·9*	*1·4*	*75·0*
	Kossów - -	„ 21	77,767	2	2	2	*0·3*	*0·3*	—
	Dolina - - -	„ 24	90,925	2	10	9	*1·1*	*1·0*	*90·0*
	Husiatyn - -	„ 24	80,977	2	3	2	*0·8*	*0·2*	—
	Zydaczów - -	„ 24	65,114	6	6	3	*0·9*	*0·5*	*50·0*
	Stanislau - -	„ 24	105,408	16	208	124	*19·7*	*11·8*	*59·6*
	Brzozów - -	„ 26	73,108	3	27	20	*3·7*	*2·7*	*74·0*
	Czortkow - -	„ 26	64,741	2	16	12	*2·5*	*1·9*	*75·0*
	Saybusch - -	„ 26	97,810	1	1	1	[*0·1*]	[*0.1*]	—
	Sanok - -	„ 27	95,306	22	206	98	*21·8*	*10·4*	*47·6*
	Bohorodczany -	„ 28	56,205	5	75	39	*13·3*	*6·9*	*52·0*
	Nisko - -	Sept. 1	60,270	1	1	1	[*0·2*]	[*0·2*]	—
	Rohatyn - -	„ 2	95,775	1	3	3	*0·3*	*0·3*	—
	Kamionka-strumilowa.	„ 11	97,051	2	2	-	*0·2*	—	—
	Stryj - - -	„ 11	95,041	6	20	13	*2·1*	*1·4*	*65·0*
	Tlumacz - -	„ 11	90,532	2	8	4	*0·9*	*0·4*	*50·0*
	Przemysl - -	„ 12	121,333	1	1	-	[*0·1*]	—	—
	Wieliczka - -	„ 12	103,451	1	1	1	[*0·1*]	[*0·1*]	—
	Zaleszczyki - -	„ 15	72,598	2	3	3	*0·4*	*0·4*	—
	Krakau (district)	„ 18	73,381	2	6	5	*0·8*	*0·7*	*83·2*
	Kalusz - -	„ 24	77,875	6	51	23	*6·5*	*3·0*	*45·1*
	Łańcut - -	Oct. 11	129,531	1	1	-	[*0·1*]	—	—
	Staremiasto - -	„ 11	50,123	8	58	33	*11·6*	*6·6*	*57·0*
	Lisko - -	„ 15	84,885	3	21	13	*2·5*	*1·5*	*62·0*
	Buczacz - -	„ 24	113,170	2	2	2	*0·2*	*0·2*	—
	Dobromil - -	„ 24	61,468	3	4	3	*0·7*	*0·5*	—
	Brody - -	„ 31	130,707	1	14	5	*1·1*	*0·4*	*35·8*
	Sambor - -	Nov. 11	85,042	1	1	1	[*0·1*]	[*0·1*]	—
	Tarnopol - -	Dec. 6	120,106	1	8	4	*0·7*	*0·3*	*50·0*
Stieiermark -	Cilli - -	Aug. 8	129,457	1	1	1	[*0·1*]	[*0·1*]	—
Bukowina -	Czernowitz (city)	„ 16	54,171	1	3	2	*0·6*	*0·4*	—
	Sereth - -	„ 25	54,124	1	11	-	[*0·2*]	—	—
	Czernowitz (district).	„ 26	91,237	1	1	1	[*0·1*]	[*0·1*]	—
	Kotzman - -	Sept. 14	90,042	1	15	10	*1·7*	*1·1*	*66·6*
Nieder Oesterreich	Wien (city) -	Aug. 22	1,364,548	1	4	3	*0·03*	*0·02*	—
Austria -	- - - -	- -	5,050,045	160	1,473	865	2·9	1·7	58·7

From Table XXV. (p. 66) it will be seen that in the autumn epidemic of 1893, 160 towns and villages in Austria were invaded by cholera, that the total number of attacks was 1,473, and that of these 865, or 58·7 per cent., were fatal. These figures are equivalent to an attack rate of 2·9 and a death rate of 1·7 per 10,000 of the aggregate population living in the invaded counties and towns. Of the invaded counties the largest proportion of deaths occurred in the four counties of Nadwórna, Stanislau, Sanok, and Kolomea, where the rates of cholera mortality were 40·0, 11·8, 10·4, and 6·8 per 10,000 of the population respectively. In Map XI. the relative mortality from cholera in the several departments of Austria is shown graphically.

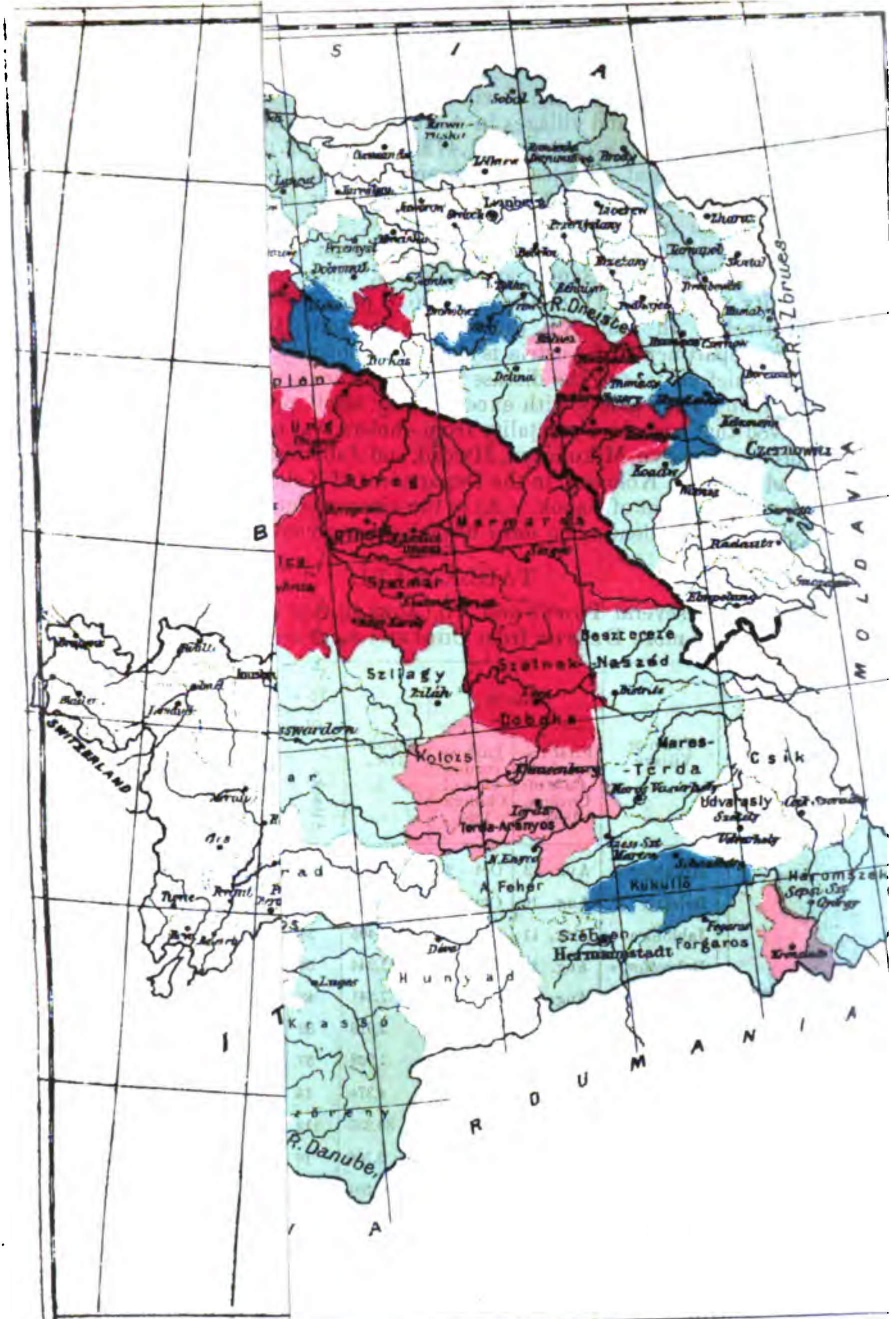
The chief centres of the disease in Austria are given in Table XXVI., and putting aside places with exceptionally small populations, it will be observed that excessive mortality from cholera was noted in the towns of Dobrotów, Delatyn, Mikuliczyn, Hwozd, and Jablonica, in the Department of Nadwórna; in Kolomea, in the Department of Kolomea; and Rymanów, in the Department of Sanok. As to the circumstances which led to these exceptional prevalences, no *data* have been received in this country.

TABLE XXVI.

Showing the several Towns and Villages situate in Austria in which Ten or more Deaths from Cholera were recorded in 1893.

Department.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Rates per 10,000 of the Population. Cholera: Attacks.	Rates per 10,000 of the Population. Cholera: Deaths.	Deaths per centage of recorded Attacks, "Fatality."
Nadwórna	Mikuliczyn	Aug. 3	Oct. 20	3,295	72	44	218·5	133·5	61·1
	Delatyn	Aug. 10	Oct. 20	5,274	112	75	212·5	142·2	67·0
	Jablonica	Aug. 11	Oct. 11	1,405	23	16	163·7	113·9	69·5
	Dobrotów	Aug. 13	Oct. 17	1,244	56	31	450·5	249·2	55·3
	Nadwórna	Aug. 20	Oct. 26	7,341	49	38	66·8	51·8	77·6
	Krasna	Aug. 29	Oct. 5	2,016	32	11	158·7	54·6	34·4
	Hwozd	Sept. 2	Oct. 10	1,958	57	27	291·2	137·9	47·4
	Pniów	Sept. 10	Oct. 2	4,374	14	12	32·0	27·4	85·7
Kolomea	Kolomea	Aug. 14	Oct. 30	30,235	112	64	37·1	21·2	57·1
Horodenka	Czerniatyn	Aug. 19	Sept. 11	2,766	16	12	57·9	43·4	75·0
Stanislau	Stanislau	Aug. 24	Oct. 19	22,391	23	15	10·3	6·7	65·2
	Knihinin Polski.	Aug. 28	Oct. 26	6,918	31	24	44·8	34·7	77·4
	Opryszowce	Sept. 4	Oct. 4	1,137	19	14	167·0	123·1	73·7
	Zagwózdz	Sept. 23	Oct. 25	1,653	32	12	193·6	72·6	37·5
	Uzin	Oct. 13	Oct. 28	900	33	16	366·5	177·8	48·5
	Pacyków	Oct. 13	Nov. 3	1,067	33	19	309·5	178·0	57·6
Brzozów	Jasienica	Aug. 26	Sept. 16	2,355	23	17	97·6	72·2	74·0
Sanok	Rymanów	Aug. 31	Dec. 16	3,704	130	58	351·0	156·6	44·6
Bohorodczany.	Bohorodczany.	Sept. 4	Nov. 2	4,819	43	23	89·2	47·8	53·5
Kaluss	Humenów	Sept. 24	Oct. 17	280	25	10	658·0	263·2	40·0
Stare Miasto	Chyrów	Sept. 1	Dec. 6	2,574	38	22	147·6	85·5	57·9

Map XI.



Mortality per 10

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Invaded Depa unties of Austro-Hungary in 1893.

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On the Western Diffusion of Cholera in 1893; by Dr. Barry.

From Table XXV. (p. 66) it will be seen that in the autumn epidemic of 1893, 160 towns and villages in Austria were invaded by cholera, that the total number of attacks was 1,473, and that of these 865, or 58·7 per cent., were fatal. These figures are equivalent to an attack rate of 2·9 and a death rate of 1·7 per 10,000 of the aggregate population living in the invaded counties and towns. Of the invaded counties the largest proportion of deaths occurred in the four counties of Nadwórna, Stanislau, Sanok, and Kolomea, where the rates of cholera mortality were 40·0, 11·8, 10·4, and 6·8 per 10,000 of the population respectively. In Map XI. the relative mortality from cholera in the several departments of Austria is shown graphically.

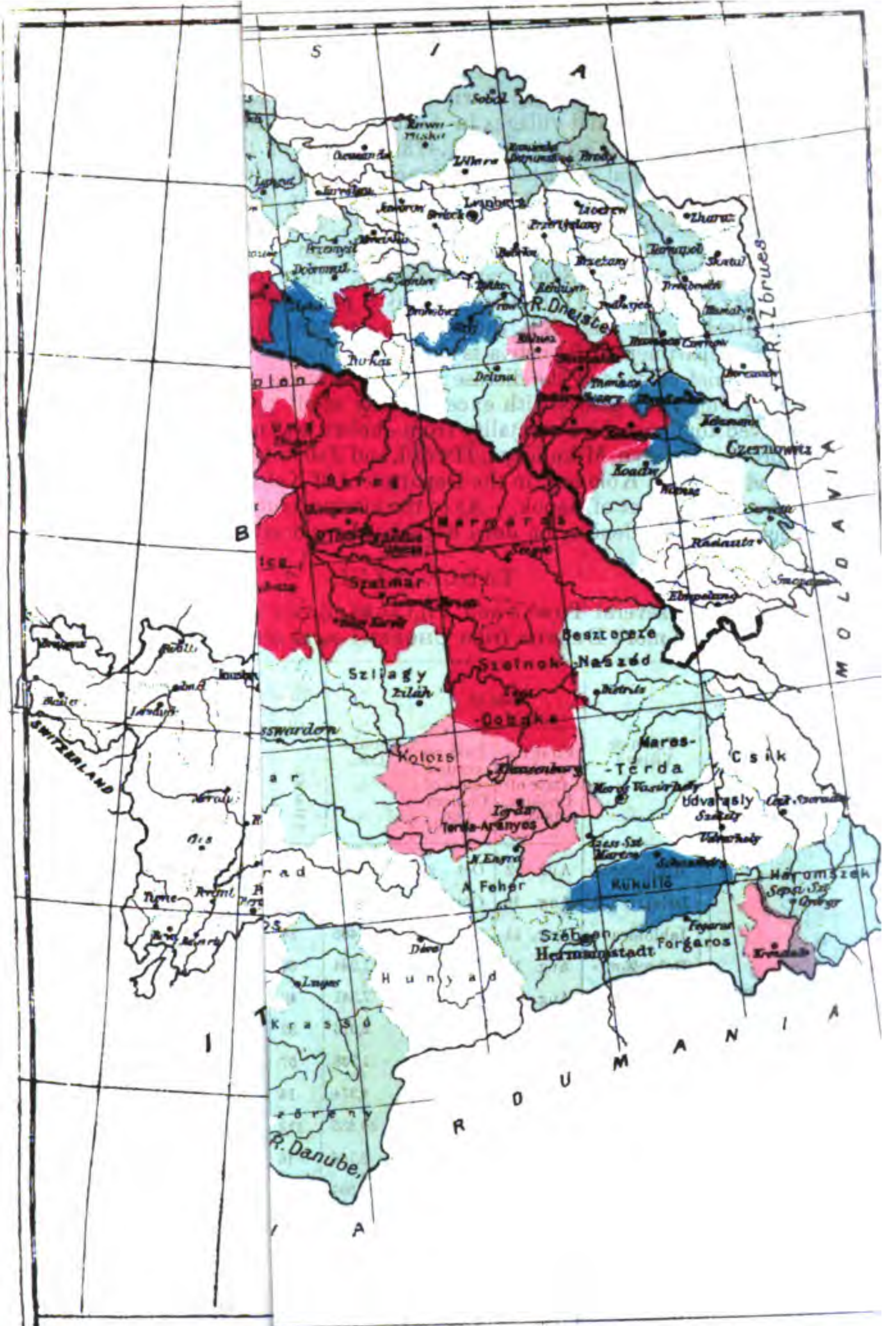
The chief centres of the disease in Austria are given in Table XXVI., and putting aside places with exceptionally small populations, it will be observed that excessive mortality from cholera was noted in the towns of Dobrotów, Delatyn, Mikuliczyn, Hwozd, and Jablonica, in the Department of Nadwórna; in Kolomea, in the Department of Kolomea; and Rymanów, in the Department of Sanok. As to the circumstances which led to these exceptional prevalences, no *data* have been received in this country.

TABLE XXVI.

Showing the several Towns and Villages situate in Austria in which Ten or more Deaths from Cholera were recorded in 1893.

Department.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Rates per 10,000 of the Population. Cholera: Attacks.	Rates per 10,000 of the Population. Cholera: Deaths.	Deaths per centage of recorded Attacks. "Fatality."
Nadwórna -	Mikuliczyn	Aug. 3	Oct. 20	3,295	72	44	218·5	133·5	61·1
	Delatyn -	Aug. 10	Oct. 20	5,274	112	75	212·5	142·2	67·0
	Jablonica -	Aug. 11	Oct. 11	1,405	23	16	163·7	113·9	69·5
	Dobrotów -	Aug. 13	Oct. 17	1,244	56	31	450·3	249·2	55·8
	Nadwórna -	Aug. 20	Oct. 26	7,341	49	38	66·8	51·8	77·6
	Krasna -	Aug. 29	Oct. 5	2,016	32	11	158·7	54·6	34·4
	Hwozd -	Sept. 2	Oct. 10	1,958	57	27	291·2	137·9	47·4
	Pniów -	Sept. 10	Oct. 2	4,374	14	12	32·0	27·4	85·7
Kolomea -	Kolomea -	Aug. 14	Oct. 30	30,235	112	64	37·1	21·2	57·1
Horodenka -	Czerniatyn -	Aug. 19	Sept. 11	2,766	16	12	57·9	43·4	75·0
Stanislau -	Stanislau -	Aug. 24	Oct. 19	22,391	23	15	10·3	6·7	65·2
	Knihinin Polski.	Aug. 28	Oct. 26	6,918	31	24	44·8	34·7	77·5
	Opryszowce	Sept. 4	Oct. 4	1,137	19	14	167·0	123·1	73·7
	Zagwózdz -	Sept. 23	Oct. 25	1,653	32	12	193·8	72·6	37·5
	Uzin - -	Oct. 13	Oct. 28	900	33	16	366·5	177·8	48·5
	Pacyków -	Oct. 13	Nov. 3	1,067	33	19	309·5	178·0	57·6
Brzozów -	Jasienica -	Aug. 26	Sept. 16	2,355	23	17	97·6	72·2	74·0
Sanok - -	Rymanów -	Aug. 31	Dec. 16	3,704	130	58	351·0	156·6	44·6
Bohorodczany.	Bohorodczany.	Sept. 4	Nov. 2	4,819	43	23	89·2	47·8	53·5
Kaluss -	Humenów -	Sept. 24	Oct. 17	380	25	10	658·0	263·2	40·0
Stare Miasto	Chyrów -	Sept. 1	Dec. 6	2,574	38	22	147·6	85·5	57·9

Map XI.



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unties of Austro-Hungary in 1893.

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The statistics of cholera in the several town and villages of Austria are given in Table B (1) appended to this report.

(3.) *Bosnia.*

According to the official Report* upon Cholera in Bosnia, it seems that although the appearance of cholera in 1893 in the frontier town of Brcka was unexpected, the Bosnian authorities were fully prepared to deal with it. Detailed precautions against cholera had been drawn up by the Government early in 1892, and, notwithstanding the fact that cholera prevailed extensively in Hungary in the autumn of that year, and had invaded some towns in Slavonia situate on the Rivers Una and Save, in the immediate neighbourhood of Bosnia, the immunity from cholera enjoyed by the country in 1892 was attributed to the carrying out of these precautions.

The following is a summary of the measures taken:—

Seventy hospitals were provided, with a total bed space for 120 beds, and these were kept fully prepared for the reception of cases. The local officials were furnished with large supplies of carbolic acid. In addition to the permanent hospitals, 20 portable hospitals, each with the necessary equipment for from 10 to 30 beds, were procured. A number of these were placed at the frontier observation stations, and the remainder were reserved for transportation to any place where an outbreak should occur. Medical observation stations were arranged at the most important points of entry on the banks of the Save and the Una, as, for example, at Doberlin, Gradiska, Sjekovac, Brod, Raca, Brcka, and Samac on the Slavonian frontier, and at a later date stations were established at Vardiste and Metalka-Sattel, on the Servian and Turkish frontiers respectively. Each of these stations was furnished with a steam disinfecting apparatus in addition to the temporary hospital.

On June 25th, 1893, in consequence of information received of the occurrence of suspicious cases in Hungary, the local authorities throughout the country were warned of the necessity of being prepared to deal with cholera, should it appear. On August 8th the Bosnian Government received telegraphic information from the Hungarian Minister of the Interior to the effect that a number of Bosnian workmen, who had been engaged on railway works in the county of Mármaros, had, in consequence of an outbreak of cholera there, dispersed to seek their homes in Bosnia. Instructions were at once given that all workmen entering Bosnia either by rail, road, or river from Mármaros were to be subjected to five days' observation, and disinfection of their effects was to take place before they were allowed to proceed to their destinations. All persons from cholera-infected districts on going to the interior of the country were provided with certificates by the health authorities, and the local officials of the place of destination were duly notified by telegram of their approach. In accordance with the terms of the Dresden Convention, no restrictions were placed upon the transmission of written or printed matter through the post, but as regards goods sent by parcels post, a declaration was required as to their nature; and the transmission of used clothing, bedding, and the like was prohibited until they had been disinfected. Especial precautions were taken with respect to the movements of the troops which took place in September and October, and also as regards the return of pilgrims from Mecca.

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* Die Cholera in Bosnien im Jahre 1893. Herausgegeben vom Bosnischen Bureau des Gemeinsamen Reichs-Finanzministeriums, Wein, 1895.

At the beginning of September cholera had become widespread in Hungary, and had also appeared at Jascnovac, which is situate at the point where the Una joins the Save. On September 23rd information was received by the Goverment that on the night of September 22nd–23rd two workmen employed on the quay at the frontier town of Brcka had been attacked with symptoms suspicious of cholera, and had been isolated in the cholera hospital there. On September 24th public notice was given directing the notification of all cases suspicious of cholera. The sending away of used clothing, bed linen, &c., from Brcka was prohibited, and persons travelling from thence were not allowed to take food or dirty linen with them. At the same time Dr. Karlinski was placed in charge of the general arrangements, and of the bacteriological station at Brcka, and after some days he confirmed the presence of Koch's comma bacillus in the dejecta of persons suffering from cholera there.

It was not ascertained how the disease was introduced into Brcka, but it was regarded as probable that it was due to the influx of workmen from North Hungary. The first three cases in Brcka occurred amongst Italian workmen employed in building a railway bridge and a quay. Although the first confirmed cases of cholera were recorded on September 23rd, it is regarded as probable that the disease had been introduced some days earlier, because on September 23rd and 24th fatal cases of cholera occurred at Maoca and Obudovac Cerovopolje respectively, in two workmen who had come from Brcka between September 20th and 22nd, and who, immediately on their return home, were attacked with choleraic symptoms. Shortly after the appearance of cholera at Brcka, it spread rapidly, especially among the Mohommedan population. This was the season of greatest commercial activity at Brcka, and numbers of people were travelling to and fro, with the result that cholera spread throughout the swampy low land of the Save Valley, in the Departments of Brcka and Gradacac, and thence extended up the Samac, and along the valleys to the foot of the Majevica mountains. Thence it spread to the Departments of Gracanica and Tuzla, including the town of Tuzla, from whence it further branched out to the south and west, as far as the Departments of Maglaj, Zvornik, and Vlasenica, and to the east as far as the Department of Bjelina.

The first cases in the Departments of Gradacac, Brcka, and Gracanica occurred in persons who had either come from the town of Brcka or who had been in contact with travellers from thence, and in like manner the further spread of cholera in the Departments of Maglaj, Tuzla, Zvornik and Vlasenica was further traced to human intercourse.

The following were the measures taken to limit the spread of the the disease in Brcka. The town was divided into four quarters, and each was placed under the supervision of a medical man. The notification of suspicious cases was carried out by night as well as by day, and each case was visited at once by the medical officer in whose district it occurred, who was accompanied by the necessary staff to carry out disinfection. The infected houses were distinguished by means of yellow flags, and watchmen were placed in charge to prevent any intercourse with the inmates until measures of cleansing and disinfection had been carried out. Articles of little value were burnt, and reasonable compensation given for them to the owners. Some of the most dilapidated buildings were destroyed. Care was taken to give the people a supply of boiled Save water, whilst the drinking of infected Brcka water and unboiled Save water was forbidden, and military guards were placed to see that this rule was not evaded. At the same time the cleansing of the Gipsy and Turkish quarters was undertaken by the

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authorities. Insanitary buildings were sought out, and a number of them were pulled down. The cleansing of the streets was rigorously enforced. Persons were not allowed to leave the infected town without a doctor's certificate to the effect that they were in good health, and intending travellers were obliged to furnish the address to which they were going, in order that telegrams might be sent to the authorities of their place of destination, so that they might be kept under observation. Schools were closed, and public-houses were shut at 8 p.m. Similar measures were carried out in each of the towns in which cholera became epidemic.

In Brcka the epidemic lasted from September 22nd to October 20th, a period of 29 days, during which 84 cases of cholera were recorded, and of these 45 died, in a population of 4,281 persons.

Three of the most dangerous cholera centres in the Department of Brcka were found at the villages of Maoca, Skakava-dolnje, and Celic. Maoca was invaded on September 23rd, and here 48 cases, 28 fatal, occurred in a population of 544 persons. Skakava was invaded on October 6th, and here 42 cases occurred, of which 15 were fatal, in a population of 750 persons. Celic was invaded on October 15th, and here there were 15 cases, 13 fatal, in a population of 1,409 persons.

From the commencement of the epidemic on September 22nd, 1893, to its termination on January 2nd, 1894, 93 places, situate in eight departments of the Government district of Tuzla were invaded by cholera, as follows:—

Brcka from September 22nd to December 31st, 372 cases in 32 places.
Gradacac from September 25th to December 10th, 244 cases in 15 places.
Gracanica from October 5th to November 23rd, 84 cases in 15 places.
Tuzla from October 8th to December 27th, 105 cases in 13 places.
Bjelina from October 10th to November 9th, 8 cases in 6 places.
Zvornik from October 11th to January 2nd, 1894, 16 cases in 5 places.
Maglaj from October 13th to December 6th, 17 cases in 4 places.
Vlasenica from November 23rd to December 29th, 34 cases in 5 places.

On October 13th a traveller from Celic was attacked with cholera on his arrival at the railway station at Sarajevo, the capital town of Bosnia. This person was at once removed to the hospital, and died there the following day. No further cases were reported to have occurred there.

Whilst the epidemic spread in the Government district of Tuzla from the Save valley to the mountains lying between the Drina and the Bosna, cholera suddenly appeared on October 19th to the west of the latter river, at Dervent, in the Government district of Banjaluka. Here 22 persons were attacked and 11 died, in a population of 4,700.

A second and separate invasion of Bosnia by cholera occurred in the beginning of November, in the western part of the country. This outbreak, which was traced to workmen who had come from Mármaros-Szigeth, in Hungary, first appeared amongst workmen employed on the Vakuf-Jajce railway, and from thence spread to several places in the Departments of Bugojno, Banjaluka, and Kotor-Varos, finally appearing amongst woodcutters in the forest of Cavka, in the Department of Tesanj. The spread of cholera in this second outbreak was almots entirely confined to railway workmen, or to persons who had been in communication with them. The most stringent measures were taken by the Government to stamp out this outbreak, and the last case occurred on December 16th.

From the commencement of the epidemic in Bosnia on September 23rd, 1893, to its termination on January 2nd, 1894, 113 places, situate in 18 departments, were invaded by cholera. The total recorded cases were 1,015 in number, of which 512, or 50·5 per cent. were fatal. These cases occurred in a population of 136,032 persons, and are equivalent to attack and death rates of 74·6 and 37·7 per 10,000 respectively. The statistics of cholera in the several departments of Bosnia are given in Table XXVII. Detailed statistics as to the several places invaded by cholera are given in Table B. (3) appended to this report.

In Map X. the march of cholera month by month in Bosnia during 1893 is shown graphically.

TABLE XXVII.

STATISTICS of CHOLERA in the several DEPARTMENTS (Bezirke) of BOSNIA in 1893.

Government District.	Department.	Date of first recorded Case of Cholera, 1893.	Number of Places invaded.	Population of invaded Communes.	Number of recorded Cholera		Rates per 10,000 of the Population. Cholera		Deaths percentage of Cases. "Fatality."
					Cases.	Deaths.	Cases.	Deaths.	
Tuzla	Brčka	Sept. 22	32	22,632	372	174	164·4	76·9	46·8
Tuzla	Gradačac	Sept. 25	15	11,914	244	126	205·0	105·8	51·6
Tuzla	Tuzla	Oct. 4	13	12,261	105	66	85·7	53·9	62·8
Tuzla	Gračanica	Oct. 5	15	12,176	84	44	69·0	36·2	52·4
Tuzla	Bjelina	Oct. 10	6	14,675	8	3	5·5	2·0	37·5
Tuzla	Zvornik	Oct. 11	5	3,907	16	11	41·0	28·1	68·7
Tuzla	Maglaj	Oct. 13	4	1,299	17	6	130·8	46·2	35·3
Sarajevo	Sarajevo	Oct. 13	1	27,000	1	1	[0·4]	[0·4]	—
Banjaluka	Dervent	Oct. 19	2	4,707	22	11	46·8	23·4	50·0
Travnik	Bugojno	Nov. 3	6	5,421	25	16	46·1	29·5	64·0
Travnik	Travnik	Nov. 3	1	150	2	1	133·0	[66·6]	50·0
Travnik	Vakuf - Jajce Railway.	Nov. 5	1	2,000	47	18	235·0	90·0	38·3
Banjaluka	Banjaluka	Nov. 12	3	14,921	19	8	12·7	5·4	42·2
Tuzla	Vlasenica	Nov. 23	3	1,044	34	15	326·0	143·7	44·1
Banjaluka	Kotor-Varos	Nov. 24	3	1,021	10	7	98·0	68·5	70·0
Banjaluka	Tesanj	Nov. 27	2	676	7	5	103·6	74·0	71·5
Banjaluka	Prnjavor	Dec. 2	1	228	1	—	[43·9]	—	—
		Totals	113	136,032	1,015	512	74·6	37·7	50·5

The chief centres of the disease in Bosnia are given in Table XXVIII.

TABLE XXVIII.

Showing the several Towns and Villages situate in Bosnia in which Cholera was exceptionally prevalent during 1893.

Government District.	Department.	Town or Village.	Population.	Number of recorded Cholera		Rates per 10,000 Population. Cholera		Deaths per-centage of recorded Attacks. "Fatality."
				Cases.	Deaths.	Cases.	Deaths.	
Tuzla	Brčka	Brčka	4,281	84	45	196·2	105·1	54·7
		Maoča	544	48	28	882·0	518·0	58·4
		Skakava dolnje	750	42	15	560·0	200·0	35·7
		Čelié	1,400	15	13	106·4	92·2	86·6
	Gradačac	Gradačac	3,076	66	35	215·0	114·0	53·0
		Cardak Tramósnica dolnja.	319	22	12	690·0	376·5	54·5
		Špionica	1,065	28	23	263·0	216·0	82·1
		Vuckovac dolnji	534	17	12	318·4	224·5	70·6
		Srebrenik	951	50	21	526·0	221·0	42·0
	Tuzla	D. Tuzla	7,189	53	35	73·7	48·7	66·0
		Tinja	374	18	10	481·0	267·5	55·6
	Gračanica	Gračanica	3,350	28	13	83·6	38·8	46·4
Banjaluka	Dervent	Dervent	4,450	21	10	47·2	22·5	47·6
Travnik	- - -	Vakuf-Jajce Railway.	2,000	47	18	235·0	90·0	38·3

Great Britain.

(a.) *England and Wales.*

During 1893, as in 1892, cholera was from time to time imported from abroad to one and another port of England and Wales. But in an important respect the behaviour of cholera in 1893 in this country differed from that observed in 1892; for in 1893 the disease made its appearance, though to a limited extent, among the resident population of particular localities.

A detailed report on the diffusion of cholera in England and Wales in 1893 has already been published, and I only propose therefore to give a brief summary of the facts observed, referring the reader for details to the complete report.*

(*a.*) *Cholera detected on Vessels arriving in England "from Foreign" during* 1893.

During 1893, notwithstanding the prevalence of cholera at numerous Continental ports having trade with this country, only 13 cases of cholera, or disease suspected to be cholera, were detected on board or connected with vessels from foreign. A list of these cases, with certain details, is given in Table XXIX.

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* Reports and Papers on Cholera in England in 1893, with an Introduction by the Medical Officer of the Local Government Board. C.—7589, London, 1894.

TABLE XXIX.

CHOLERA detected on VESSELS arriving at ENGLISH PORTS from FOREIGN during 1893.

No. of Case.	Date of Arrival in England (a), or of Attack by Cholera (b), whichever Event occurred latest in Point of Time.	Sanitary District whence Case notified.	Facts with respect to Vessel.					Sex of Patient.	Facts with respect to Persons attacked with Cholera.				
			Name of Vessel.	Port of Departure.		Port of Arrival.			Date of Cholera Attack.	Place of Attack.	Where isolated.	Date of isolation.	Result.
				Name.	Date.	Name.	Date.						
1	1893. June 25 (a)	River Tyne Port	"Myrtle Branch."	Nantes	June 20	River Tyne	June 25	M	June 25	At sea	-	—	Died June 25.
2	July 18 (a)	Cardiff Port	"Blue Jacket"	Marseilles	July 9	Cardiff	July 18	M	July 9	,,	Cardiff Port Hospital, Flatholm.	July 19	Recovered.
3	,, 18 (a)	,, ,,	,, ,,	,,	,, ,,	,,	,, ,,	M	,, 15	,,	,, ,,	,, ,,	,,
4	,, 20 (a)	London Port	"Altmore"	,,	3	London	,, 20	M	,, 5	,,	London Port Hospital.	,, 20	,,
5	,, 24 (a)	Liverpool Port	"Ant"	St. Petersburg, Dieppe	June 27 July 21	Liverpool	,, 24	M	June 29	,,	Liverpool Port Hospital.	,, 25	,,
6	,, 24 (a)	,, ,,	,,	,, ,,	,,	,,	,, ,,	M	July 23	,,	,, ,,	,, 25	,,
7	,, 26 (b)	St. George in the East Urban (London).	"Altmore"	Marseilles	,, 3	London	,, 20	M	,, 26	16, Raymond Street, Wapping.	London Port Hospital.	,, 26	,,
8	Aug. 2 (a)	London Port	"Elisabeth McLea."	Cherbourg	,, 31	,,	Aug. 2	M	Aug. 1	At sea	,, ,,	Aug. 2	,,
9	,, 2 (a)	Grimsby Port	"Dania"	Antwerp	,, 30	Grimsby	,, 2	M	July 30	,,	Grimsby Port Hospital.	,, 3	Died Aug. 3.
10	,, 3 (b)	Liverpool Urban.	"Mananeuse"	Brazil Havre	,, 22 Aug. 20	Liverpool	,, 23	M	Aug. 23	171, Grafton Street, Liverpool.	Park Hill Hospital.	,, 23	Recovered.
11	Sept. 18 (a)	Southampton Port.	"Glenmore"	Braila Sulina	,, 18 ,, 27	Southampton	Sept. 18	M	,, 30	At sea	Southampton Port Hospital.	Sept. 18	,,
12	,, 23 (a)	London Port	"Ashbrook"	Cronstadt	Sept. 14	London	,, 23	M	Sept. 17	,,	London Port Hospital.	,, 23	Died Sept. 23.
13	Oct. 1 (a)	River Blyth Port.	,,	Cronstadt London	,, 14 ,, 30	River Blyth	Oct. 1	M	,, 30	,,	River Blyth Port Hospital.	Oct. 1	Died Oct. 1.

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These 13 cases entered the country at seven ports, namely, London 4, Liverpool 3, Cardiff 2, and the River Tyne, River Blyth, Grimsby, and Southampton, 1 at each. Nine of the cases were reported between July 18th and August 23rd, two during the month of September, and one each during the months of June and October. Of the 13 cases 4 proved fatal.

The reputed source of infection in the 13 cases was as follows:—Marseilles 4, Cronstadt 2, St. Petersburg 2, Nantes 1, Cherbourg 1, Antwerp 1, Havre 1, and Sulina 1.

The topographical situation of the ports in England and Wales at which cases of cholera "from foreign" were detected in 1893 is indicated in Map XII.

In addition to the vessels named above, which were reported to have actually had cholera cases on board on their arrival, a number of vessels reached the ports of this country in 1893, as in the previous year, on which cases of cholera had occurred on the voyage. In all cases the usual procedure followed at English ports was carried out, the vessel in each instance being sent to the appointed mooring station for disinfection, and all persons on board, who, on medical examination were found to be free from suspicion of cholera, allowed to land at once upon furnishing the Port Medical Officer of Health with their names and addresses.

(*b.*) *Reputed Cholera among English Communities.*

In the following Table XXX. is shown the total number of attacks and of deaths referred to cholera in each locality where it was reported to have appeared in 1893. The rates of attack and of death per 10,000 of the population of the districts in which the cases occurred are also given.

TABLE XXX.

Showing the Number of Attacks and of Deaths referred to Cholera in English Communities in 1893.

[*In this Table rates taken on single attacks or single deaths respectively are placed in square brackets.*]

(*a.*) *In extra-Metropolitan Districts.*

County.	Locality in which reputed Cholera appeared in 1893.	Population, Census 1891.	Date of onset of First Case reputed to be Cholera.	Total reputed Cholera		Rate, per 10,000 of Population. Cholera	
				Attacks.	Deaths.	Attacks.	Deaths.
Lincolnshire	Grimsby	51,934	9 Aug.	127	35	*24·5*	*6·7*
	Lincoln	41,491	9 "	1	1	[*0·2*]	[*0·2*]
	Cleethorpes	4,306	15 "	11	7	*25·5*	*16·5*
	Tetney (Louth R.)	775	2 Sept.	1	1	[*129·0*]	[*129·0*]
	Brigg	3,100	5 "	1	1	[*33·4*]	[*33·4*]
	Boston	14,593	6 "	1	1	[*0·7*]	[*0·7*]
	Morton (Gainsborough R.)	1,187	7 "	1	1	[*8·8*]	[*8·8*]
	Owston Ferry (Gainsborough R.)	1,294	13 "	1	1	[*7·7*]	[*7·7*]

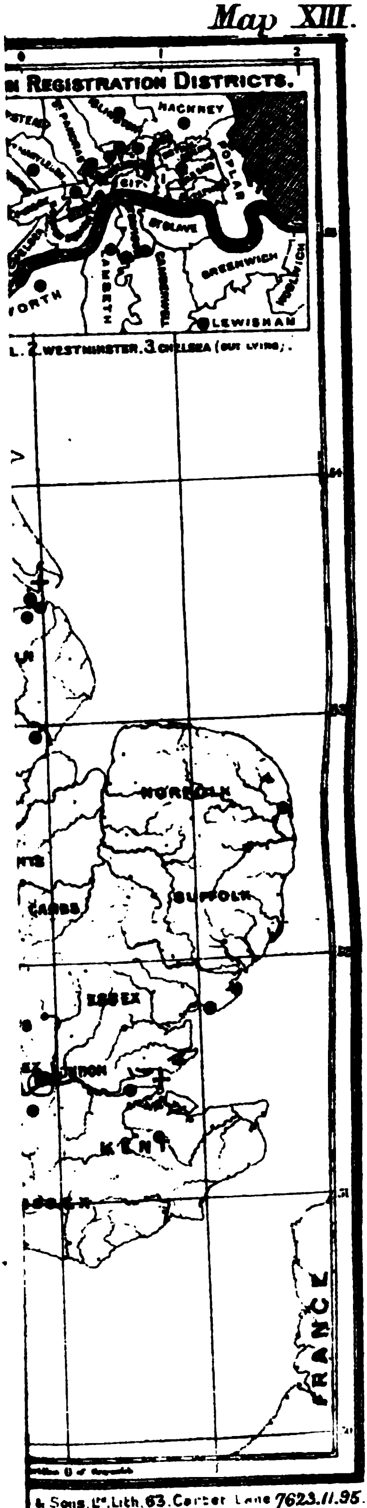
County.	Locality in which reputed Cholera appeared in 1893.	Population, Census 1891.	Date of onset of First Case reputed to be Cholera.	Total reputed Cholera		Rate per 10,000 of Population. Cholera	
				Attacks.	Deaths.	Attacks.	Deaths.
Yorkshire	Kingston-upon-Hull	200,044	16 Aug.	17*	12*	0·8	0·6
	Rotherham	42,061	24 „	3†	†	0·7	0.5
	Monk Bretton	3,426	2 Sept.	1	1	[2·9]	[2·9]
	Bradford	216,361	3 „	1	1	[0·05]	[0·05]
	Appleton-le-Street (Malton R.)	151	6 „	5	3	331·0	199·0
	Doncaster	25,933	7 „	1	1	[0·4]	[0·4]
	Handsworth	10,295	10 „	1	1	[1·0]	[1·0]
	North Bierley	22,178	18 „	7	6	3·2	2·7
	Idle	7,118	22 „	1	—	[1·4]	—
	Balby (Doncaster R.)	4,270	7 Oct.	2	1	4·7	[2·3]
	Rawmarsh	11,933	10 „	1	1	[0·8]	[0·8]
	Keighley	30,810	12 „	3	2	1·0	0·65
	Bingley	10,023	17 „	1	1	[1·0]	[1·0]
Lancashire	Middleton	22,102	4 Sept.	3	2	1·4	0·9
	Manchester	505,368	11 „	4	2	0·08	0·04
	Hurst	6,772	12 „	1	1	[1·5]	[1·5]
	Accrington	38,603	13 „	2	2	0·5	0·5
	Blackburn	120,064	17 „	1	1	[0·08]	[0·08]
	Liverpool	517,980	18 „	2	2	0·04	0·04
	Ormskirk	6,298	6 Oct.	1	1	[1·6]	[1·6]
	Warrington	52,743	13 „	1	1	[0·2]	[0·2]
Derbyshire	Ashbourne	3,809	6 Sept.	15	9	39·4	23·6
	Ilkeston	19,744	9 „	4	3	2·0	1·5
	Derby	94,146	14 „	1	1	[0·1]	[0·1]
Middlesex (extra Metropolitan).	Willesden	61,265	7 „	1	1	[0·2]	[0·2]
Norfolk	Great Yarmouth	49,334	8 „	4	3	0·8	0·6
Essex	Great Clacton	3,584	8 „	11	1	30·7	[2·8]
Leicestershire	Leicester	174,624	9 „	1	1	[0·06]	[0·06]
Nottinghamshire.	Mansfield	15,925	9 „	1	1	[0·6]	[0·6]
	East Retford	10,603	10 „	1	1	[1·0]	[1·0]
Durham	South Shields	78,391	10 „	2	2	0·2	0·2
	Stockton-on-Tees	49,705	14 „	1	1	[0·2]	[0·2]
Surrey (extra-Metropolitan.)	Mitcham (Croydon R.)	12,127	11 „	1	—	[0·8]	—
	Croydon	102,695	13 „	1	1	[0·1]	[0·1]
Northumberland.	River Tyne	—	17 „	1	1	—	—
	Newcastle-on-Tyne	186,300	20 „	4	2	0·2	0·1
Kent (extra-metropolitan.)	West Malling (Malling R.)	2,254	24 „	1	1	[4·4]	[4·4]
Staffordshire	Rowley Regis	30,791	25 „	8	2	2·6	0·65
	Coton Hill Asylum	199	26 „	2	2	—	—
Hampshire	Crondall (Hartley Wintney R.)	3,898	2 Oct.	6	—	15·4	—
Gloucestershire	Gloucester	39,444	3 „	1	1	[0·2]	[0·2]

* In addition there were reported 152 cases of choleraic diarrhœa, of which 7 were fatal.

† In addition there were reported 18 cases of choleraic diarrhœa, of which 1 was fatal.

1893.

Map XIII.



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(*b.*) *In Metropolitan Districts.*

---	Metropolitan Areas in which reputed Cholera appeared in 1893.	Population, Census 1891.	Date of onset of First Case reputed to be Cholera.	Total reputed Cholera		Rate per 10,000 of Population. Cholera	
				Attacks.	Deaths.	Attacks.	Deaths.
Metropolitan Districts.	Shoreditch - -	124,009	18 Aug.	1	1	[*0·08*]	[*0·08*]
	St. Margaret and St. John the Evangelist, Westminster.	55,539	5 Sept.	1	1	[*0·2*]	[*0·2*]
	St. Marylebone - -	142,404	7 „	1	1	[*0·07*]	[*0·07*]
	Bethnal Green - -	129,132	8 „	1	1	[*0·08*]	[*0·08*]
	Clerkenwell - -	66,216	8 „	3	—	*0·5*	—
	Fulham - - -	91,639	10 „	1	1	[*0·1*]	[*0·1*]
	Lambeth - - -	275,203	10 „	1	1	[*0·04*]	[*0·04*]
	London Port - -	—	13 „	1	—	—	—
	Newington - -	115,804	14 „	1	1	[*0·08*]	[*0·08*]
	St. Luke - -	42,440	14 „	1	—	[*0·2*]	—
	Hackney - - -	220,342	18 „	1	—	[*0·04*]	—
	Lewisham - -	92,647	20 „	1	—	[*0·1*]	—
	Islington - - -	319,143	23 „	1	—	[*0·08*]	—
	St. George the Martyr, Southwark.	59,712	23 „	1	1	[*0·2*]	[*0·2*]
	Battersea - -	150,558	30 „	1	1	[*0·07*]	[*0·07*]

From the above Table it will be seen that, although disease presumed to be cholera appeared in 64 towns, villages, or hamlets, in only 22 of the 64 did there occur plurality of cases. Further it appears that in not more than 5 of the 23 did the number of attacks exceed 10, namely, in Grimsby, 127; Kingston-upon-Hull, 17; Ashbourne, 15; Cleethorpe-with-Thrunscoe, 11; and Great Clacton, 11.*

The total number of persons attacked with illness deemed to be of the nature of cholera in England in 1893 (exclusive of ship-borne cases), was 287, and of these 135, or 47 per cent., died.

The topographical position of the several towns and villages in which cholera was reported to have appeared in 1893 is shown in Map XIII.

In Table XXXI. the above cases and deaths are referred to the counties in which they occurred, and rates are taken in each instance on the total populations implicated. For England and Wales and for London, attack rates and death rates calculated, in each instance, on the total population, are appended to the Table.

Assuming that all the deaths referred to cholera were, as matter of fact, examples of that disease, comparison of the cholera mortality of England and Wales in 1893 with similar mortality in this country in 1848, 1849, 1853, 1854, 1865, and 1866, the only years in which cholera has appeared in this country since registration of deaths has been enforced, suffices to demonstrate the comparatively insignificant dimensions of the recent prevalence here of the malady.

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* As regards Great Clacton it may be noted that, although included in the list, the outbreak possessed few of the characteristics of true cholera, as will be seen from a study of the details given in the complete report.

App. A. No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

TABLE XXXI.

SHOWING the NUMBER of ATTACKS and of DEATHS referred to CHOLERA in 1893 in the several COUNTIES of ENGLAND in which such CASES appeared.

[*In this Table, rates taken on single attacks or single deaths respectively are placed in square brackets.*]

County.	Date of Onset of First Case reputed to be Cholera.	Number of Localities where Disease appeared.	Population of Communities attacked (Census 1891).	Total reputed Cholera.		Rates per 10,000 of the Population	
				Attacks.	Deaths.	Attacks.	Deaths.
Lincolnshire - -	9 Aug.	8	118,630	144	48	*12·1*	*4·0*
Yorkshire - - -	16 „	13	584,653	44	32	*0·75*	*0·55*
Lancashire - -	4 Sept.	8	1,269,990	15	12	*0·1*	*0·09*
Derbyshire - -	6 „	3	117,699	20	13	*1·7*	*1·1*
Middlesex (extra-Metropolitan).	7 „	1	61,265	1	1	[*0·2*]	[*0·2*]
Norfolk - - -	8 „	1	49,334	4	3	*0·8*	*0·6*
Essex - -	8 „	1	3,584	11	1	*30·7*	[*2·8*]
Leicestershire - -	9 „	1	174,624	1	1	[*0·06*]	[*0·06*]
Nottinghamshire -	9 „	2	26,528	2		*0·75*	*0·75*
Durham - - -	10 „	2	128,396	3	3	*0·2*	*0·2*
Surrey (extra-Metropolitan).	11 „	2	114,822	2	1	*0·1*	[*0·07*]
Northumberland - -	17 „	2	186,300	5	3	*0·3*	*0·2*
Kent (extra-Metropolitan)	24 „	1	2,254	1	1	[*4·4*]	[*4·4*]
Staffordshire - -	25 „	2	30,990	10	4	*3·2*	*1·3*
Hampshire - -	2 Oct.	1	3,896	6	—	*15·4*	—
Gloucestershire - -	3 „	1	39,444	1	1	[*0·2*]	[*0·2*]
Total extra-Metropolitan Districts -		49	2,912,411	270	126	*0·9*	*0·43*
Metropolitan Districts -	18 Aug.	15	1,893,979	17	9	*0·08*	*0·045*
Total England -	- -	64	4,806,390	287	135	*0·6*	*0·3*

RATES of REPUTED CHOLERA ATTACK and DEATH in 1893, calculated on the TOTAL POPULATION.

ENGLAND AND WALES - - -	29,002,525	287	135	0·1	0·05
LONDON - - - - - - -	4,211,743	17	9	0·04	0·002

Table XXXII. makes such comparison, and shows that in 1893 the cholera death-rate of England and Wales was $\frac{1}{136}$th, and the cholera death-rate of London was $\frac{1}{920}$th, the corresponding rates recorded for 1866, the last occasion on which cholera was epidemic among our populations.

App. A. No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

TABLE XXXII.

MORTALITY STATISTICS of CHOLERA recorded in ENGLAND and WALES and in LONDON respectively in Years when CHOLERA has appeared in ENGLAND in Registration times.

Date.	England and Wales.		London.	
	Total Deaths.	Deaths per 10,000 Living.	Total Deaths.	Deaths per 10,000 Living.
1848	1,908	1·1	652	2·9
1849	53,293	30·3	14,137	61·8
1853	4,419	2·4	883	3·5
1854	20,097	10·9	10,738	42·8
1865	1,297	0·6	196	0·6
1866	14,378	6·8	5,596	18·4
1893	135	0·05	9	0·002

(b.) *Scotland.*

On August 26th the steam fishing smack "Emerald," of and from Hull, put into the harbour of Stromness with a case of diarrhœa on board. The patient stated that several hours prior to leaving Hull he had suffered from diarrhœa, that he had not solicited medical aid but had been treated by the master of the vessel with such means as were available. The Medical Officer of Health (Dr. F. L. Duncan), after examination, decided that the patient was suffering from cholera, and accordingly ordered his removal on shore. As there is no hospital accommodation nearer to Stromness than at Kirkwall, 15 miles distant, the patient was accommodated in a private house where, on August 28th, he died with well marked symptoms of cholera. No post-mortem or bacteriological examination was made. All necessary measures of disinfection were taken and no further cases were reported. After the patient had been landed and disinfectants supplied to the master, the "Emerald" proceeded on her voyage to Iceland.

The above was the only case of cholera reported to have occurred in Scotland during 1893.

SENEGAL.

On July 6th Her Majesty's Administrator of the Gambia reported that cholera had appeared at St. Louis in the French Colony of Senegal. With respect to this outbreak, no official information has been furnished by the local authorities, but from a despatch* forwarded to the Government of the United States on October 6th, by the United States Consul stationed at Goree-Dakar, it appears that cholera broke out in St. Louis on July 1st; that between July 1st and July 29th, 697 deaths from the disease were recorded there in a population of 20,173 persons, and that of the deceased four only were Europeans. At Dakar (population about 8,000) there were two deaths between the 16th and 28th July; and at Goree (population 1,500) there were 12 deaths between July 17th and the end of the epidemic. There were also recorded 22 deaths at Richard Tull, 62 at Dagana, 81 at N'Daen, 32 at Dalmath, 97 at Todor, and 35 at Malam, between July 8th and the end of the month. On December 19th the Colony was declared to be free from epidemic cholera.

No information has been received with regard to the source whence the infection was introduced into Senegal.

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* Weekly Abstract of Sanitary Reports, Vol. VIII., Washington, 1893, p. 1129.

Belgium.

The first case of illness of a character suspicious of cholera which was observed in Belgium, in 1893, occurred at Anvers (Antwerp) on May 31st. This case ended in recovery and was regarded by the local authorities as "cholera nostras." During July isolated cases of cholera appeared at several places, notably at Mont-sur-Marchienne in the province of Hainaut, where there was a case on July 3rd, and another on the 27th of the same month, the latter case proving fatal. On July 6th a fatal case occurred at Flémalle Grande, in the province of Liége, and on the same day, two deaths due to cholera were recorded at Alost, in the province of Flandre Orientale. On July 10th cholera appeared at Coutrai, in the province of Flandre Occidentale, and a doubtful case occurred at Termonde, in Flandre Orientale. Up to the last week in July eight cases of disease suspected to be cholera had thus occurred in five of the nine provinces of Belgium. On July 28th a boatwoman in the La Campiere Dock at Anvers was attacked with cholera and died on July 30th. On the last named date a boatman, who had left Anvers the previous day, died of cholera at Olsene, in the province of Flandre Orientale. On August 2nd a boatman, on reaching Anvers from Rotterdam, was attacked by cholera when his boat was anchored in the dock, and died the same day in hospital. On August 4th a cabinet maker residing in Anvers was taken to hospital suffering from cholera, and on the same day a boat-woman died of the disease at Rupelmonde, having come there ill three days previously. New cases, to the number of five, appeared between August 8th and 11th, amongst sailors, boatmen, and dock labourers employed at Anvers. From this date onwards cases continued to occur, attacking in the first instance the population of the docks, and thence spreading little by little amongst the poorer classes.

As has already been stated cholera was carried from Anvers to Rupelmonde and Olsene, and later it was transmitted directly to the following localities:—

August 13th, to Burght, in the province of Flandre Orientale.
August 18th, to Melsele, in the province of Flandre Orientale.
August 19th, to Beirendrecht, in the province of Anvers.
August 25th, to Exaerde, in the province of Flandre Orientale.
August 26th, to Wyneghem, in the province of Anvers.
August 27th, to Stabroeck, in the province of Anvers.
September 2nd, to Zwyndrecht, in the province of Flandre Orientale.

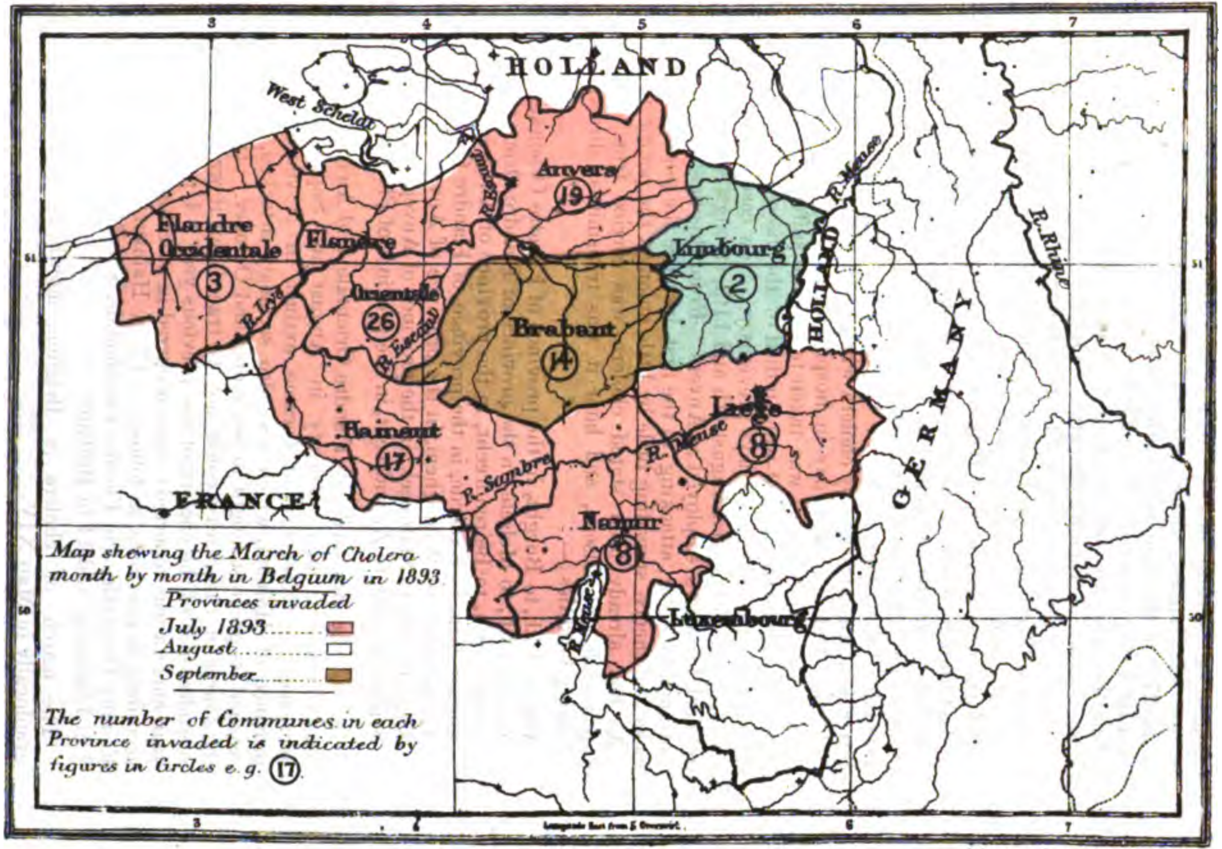
In both the provinces of Flandre Orientale and Anvers the disease reached its maximum intensity in August and September, rapidly decreased in October, and became extinct in November. In the province of Hainaut, which was also seriously attacked, the epidemic reached its greatest height in September and October. In this province the source of the disease could not be traced, but it was regarded as a recrudescence of the cholera of the previous year. Up to the end of the year cholera was reported to have occurred in 97 communes, apportioned according to provinces, as follows:—17 in Hainaut, 8 in Liège, 26 in Flandre Orientale, 3 in Flandre Occidentale, 8 in Namur, 19 in Anvers, 2 in Limbourg, and 14 in Brabant.

The march of cholera in Belgium, month by month, is shown graphically in Map XIV.

The total number of cases recorded in Belgium, during the year 1893, was 615, and of these 372 proved fatal. These figures are equivalent to attack and to death rates of 1·0 and 0·6 respectively per 10,000 of the population.

CHOLERA IN BELGIUM 1893.

Map XIV.



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The chief centres of the disease in Belgium, in 1893, are given in Table XXXIII.

TABLE XXXIII.

Showing the Chief Centres of Cholera in Belgium in 1893.

Name of Place.	Date of first reported Case of Cholera.	Population.	Total recorded Cholera		Rates per 10,000 of Population. Cholera		Per-centage of Deaths to Attacks. "Fatality."
			Attacks.	Deaths.	Attacks.	Deaths.	
Province of Hainaut.							
Mont-sur-Marchienne.	July 3	6,752	15	9	*22·2*	*13·3*	*60·0*
Dampremy	Sept. 12	8,941	27	18	*30·2*	*20·1*	*66·6*
Marchienne-au-Pont.	„ 15	15,157	73	47	*48·1*	*31·0*	*64·4*
Charleroy	„ 21	20,668	44	23	*21·3*	*11·1*	*52·3*
Montignies-sur-Sambre.	Oct. 3	15,479	15	7	*9·7*	*4·5*	*46·7*
Couillet	„ 4	8,326	6	2	*7·2*	*2·4*	*33·3*
Marcinelle	„ 9	11,187	6	5	*5·4*	*4·5*	*83·4*
Châtelineau	„ 17	10,188	20	12	*19·7*	*11·8*	*60·0*
Province of Liège.							
Liège	Aug. 19	147,660	5	4	*0·3*	*0·27*	*80·0*
Province of Flandre Orientale.							
Rupelmonde	Aug. 1	3,182	21	8	*66·0*	*25·1*	*38·1*
Burght	„ 13	2,570	21	11	*81·7*	*42·8*	*52·4*
Hamme	„ 21	12,039	5	3	*4·1*	*2·5*	*60·0*
Selzaete	Sept. 17	5,241	6	4	*11·4*	*7·6*	*66·6*
Province of Namur.							
Florennes	Oct. 21	2,552	5	2	*19·6*	*7·8*	*40·0*
Namur	Dec. 12	30,087	5	3	*1·7*	*1·0*	*60·0*
Province of Anvers.							
Anvers	July 28	224,012	119	75	*5·3*	*3·3*	*63·0*
Hingene	Aug. 13	3,739	9	8	*24·1*	*21·4*	*88·9*
Hemixem	„ 18	3,676	6	6	*16·3*	*16·3*	*100·0*
Wynegham	„ 26	2,868	8	4	*27·9*	*13·9*	*50·0*
Stabroeck	„ 27	3,647	20	13	*54·8*	*35·6*	*65·0*
Willebroeck	Sept. 1	8,164	22	18	*27·0*	*22·1*	*81·8*
Boom	„ 5	13,892	14	7	*10·1*	*5·0*	*50·0*
Province of Brabant.							
Molenbeek-Saint-Jean.	Sept. 14	48,723	9	7	*1·8*	*1·4*	*77·8*
Saint-Gilles	„ 25	40,289	14	8	*3·5*	*2·0*	*57·1*

App. A. No. 16.

On the Western Diffusion of Cholera in 1893; by Dr. Barry.

In the following Table XXXIV., are given the attacks and deaths from cholera which were recorded in the several provinces of Belgium in 1893. It may be noted that in addition to the cases given in the Table, 232 other cases suspicious of cholera were reported to have occurred, but in consequence of a study of the clinical symptoms and of the results of the bacteriological examinations, these cases were not considered by the Belgian authorities to be due to true cholera.

In Map XV. the relative mortality from cholera in the several provinces of Belgium in 1893 is shown graphically.

TABLE XXXIV.

STATISTICS of CHOLERA in the several PROVINCES of BELGIUM during 1893.

Province.	Date of first recorded Case of Cholera 1893.	Population, Census 1889.	Number of Communes invaded by Cholera 1893.	Total recorded Cholera		Rates per 10,000 of the Population. Cholera		Per-centage of Attacks to Deaths. "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Hainaut - -	July 3	1,048,546	17	224	131	*2·1*	*1·25*	*58·5*
Liège - - -	„ 6	726,734	8	12	6	*0·2*	*0·1*	*50·0*
Flandre Orientale -	„ 6	949,526	26	89	47	*0·9*	*0·5*	*52·8*
Flandre Occidentale	„ 10	738,442	3	6	4	*0·08*	*0·05*	—
Namur - -	„ 15	335,471	8	16	8	*0·5*	*0·2*	*50·0*
Anvers - -	„ 28	699,919	19	223	145	*3·2*	*2·1*	*65·0*
Limbourg - -	Aug. 16	222,814	2	3	3	*0·1*	*0·1*	—
Brabant - -	Sept. 14	1,106,158	14	42	28	*0·4*	*0·25*	*66·7*
Luxembourg - -	—	211,711	—	—	—	—	—	—
Belgium - -	—	**6,069,321**	**97**	**615**	**372**	**1·0**	**0·6**	**60·5**

ALGERIA.

On July 8th Her Majesty's Consul-General at Algiers reported that cholera had broken out at Biskra, a district situate in the south of the department of Constantine. At the same time he noted the fact that the pilgrims had not at that time returned from Mecca. With respect to cholera in Algeria in 1893 the greatest reticence has been displayed by the authorities, indeed beyond the notification in the monthly mortality statistics of the large towns of France and Algeria, of the fact that a total of 58 deaths from cholera had been recorded between July and December 1893 in certain of the large towns of Algeria, no information as to the epidemic has been officially published.

For the following account I am mainly indebted to an article published in the Lancet.* From this it would appear that the first case of cholera in Algeria in 1893 occurred at the end of June in the garrison of Tougourt. A few days later, cases were reported at Tiliach, an Arab commune in the district of Biskra. At first there were only a few scattered cases, but very soon the disease spread, and broke out not only in the town of Biskra, but throughout the department of Constantine.

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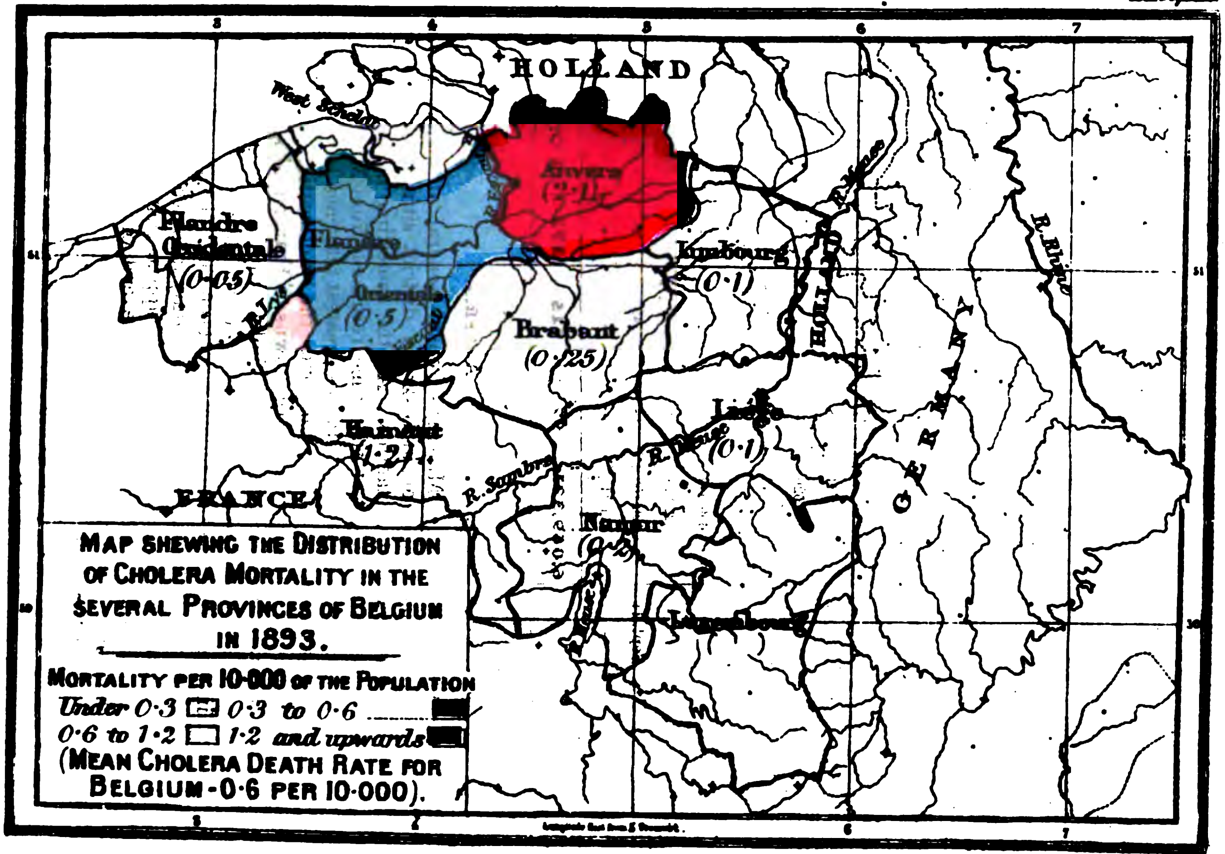
* Cholera in Algeria, from our Special Correspondent, "The Lancet," Vol. II., 1893, pp. 1337, 1338.

CHOLERA IN BELGIUM 1893.

Map XV.


HOLLAND
West Schelde
Anvers (2·1)
Flandre Occidentale (0·05)
Flandre Orientale (0·5)
Brabant (0·125)
Limbourg (0·1)
Liège (0·1)
Hainaut (1·2)
Namur
Luxembourg
FRANCE
GERMANY
R. Rhine
R. Meuse
R. Sambre
R. Lys
MAP SHEWING THE DISTRIBUTION OF CHOLERA MORTALITY IN THE SEVERAL PROVINCES OF BELGIUM IN 1893.
MORTALITY PER 10·000 OF THE POPULATION
Under 0·3 ▤ 0·3 to 0·6 ■
0·6 to 1·2 ☐ 1·2 and upwards ■
(MEAN CHOLERA DEATH RATE FOR BELGIUM - 0·6 PER 10·000).
3
4
5
6
7
51
50

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Energetic measures were apparently at once taken to control the spread of the disease. Dr. Soulié, Professor at the Medical School of Algiers, was deputed to establish a sanitary station at El Kantara, and here a hospital was provided. Other sanitary posts were organised at Bouhira, on the railway line from Constantine to Algiers; at Bou-Saâda, in the department of Algiers; and at M'Sila, in the department of Constantine. The epidemic, however, continued to spread, first at Biskra, and from thence travelling northwards to Kroub, M'Sila, Oued-Atménia, El-Ghenah, Châteaudun, and Aïn M'Lila, finally reaching Constantine. From Constantine the disease reached the sea coast at Phillipville, and thence arrived at the Port of Collo. Whilst cholera was spreading northwards, fresh cases occurred at Tougourt, in the extreme south, where the epidemic had begun. After travelling from the south to the north, cholera spread east and west along the main lines of communication. Towards the middle of September, cases were reported at Bou-Saâda, and among the Arab tribes in its immediate neighbourhood. On September 20th, H.M. Consul-General reported that cholera had appeared among the native tribes at Bir-Rabalou, near Aumale, in the department of Algiers, and that the disease was marching steadily westwards. In a despatch dated September 21st he further stated that 14 deaths from "epidemie cholérique" had occurred at Oued-Zenati, a railway station between Khroub and Constantine, and that the Governor-General still refused to publish any information regarding the disease. Towards the east, cholera reached Guelma. The total deaths from cholera in Algeria during 1893 is estimated at upwards of a thousand. It is stated that of this number only only 37 were Europeans. Notwithstanding this mortality, there was, according to the French authorities, no "foyer" in Algeria. As to the origin of the epidemic, Dr. Soulié, who was despatched to make inquiry into the matter, is stated to have been convinced that the epidemic was not imported, but that it was merely a recrudescence of previous cholera. It is said that every year there are in the country a few deaths from a disease which is practically indistinguishable from cholera, and that it is only under exceptional circumstances that these few cases develop into a regular epidemic.

TUNIS.

On July 8th, a caravan of thirteen Arabs from Biskra in Algeria, arrived at Nefta, a town of some 7,000 inhabitants situate in the district of Djerid in the south of Tunis. At the time when these Arabs left Biskra cholera was prevalent in that place and two persons who had left Biskra with them were fatally attached by the disease during the journey; the soiled clothing of the deceased was brought to Nefta by their companions, and on July 12th, two other members of the caravan were attached by cholera at Nefta. The cases were concealed and the disease spread in Nefta and extended to some of the towns and villages in the neighbourhood, notably to Tosör, El Hamma, and El Udjian. On July 28th the infected districts were surrounded by a military cordon. At Nefta (population 7,000) cholera prevailed for 29 days, during which time about 200 persons were attacked, of whom 98 died; at Tosör (population 7,500) the epidemic lasted 22 days and gave rise to 81 cases of which 36 proved fatal; at El Hamma and El Udjian there were altogether 40 cases and 15 deaths, and in addition 7 non-commissioned officers and soldiers of the military cordon died of the disease. Cholera next spread to Gafsa (4,000 inhabitants), a town situate to the northeast of Tosör, and here 96 persons were attacked, of whom 40 died.

In October cholera was notified at Bizerta, Tunis, and Suza. In Suza up to November 12th there were 250 cases and 150 deaths. More than 4,000 of the inhabitants of Suza were reported to have left the city, and to have carried the infection to the neighbouring districts. In November, while the disease became less prevalent at Suza the epidemic increased at Tunis, spread to Goletta and to the village of Kala Kebira (near Suza), where it was very virulent, causing from 17 to 19 cases daily. Cholera was also notified at Monastir, Akonda, and Mokinue, also at Medjej, Testour, Zaghonan, and Hammamet. No reliable figures are available as to the mortality from cholera in the Regency during 1893, but from the above short notes it is apparent that the disease was widely diffused.

NETHERLANDS.

The diffusion of cholera which took place in the Netherlands in 1892, and of which an account was given in my report for that year, came to an end in January 1893, during which month three deaths were recorded, one at Amsterdam in the province of Noordholland, one at Linschotten in the province of Utrecht, and one at Osz in the province of Noordbrabant.

After the occurrence of these isolated cases, the Kingdom apparently remained free from cholera until July 13th, when a death was recorded at S'Hertogenbosch in the province of Noordbrabant.

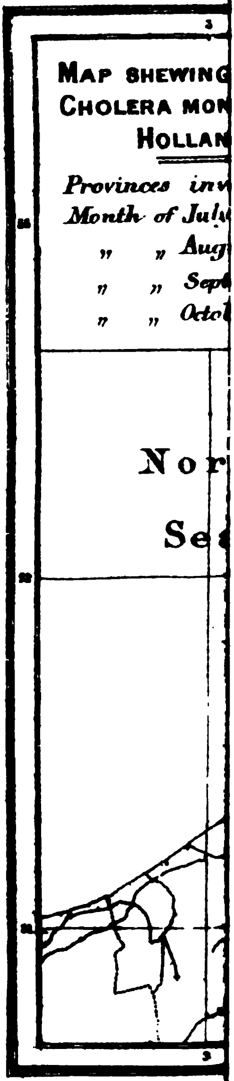
Early in August a number of cases of suspicious illness which were, however, locally regarded as "cholera nostras," occurred at Zaandam in Noordholland, at St. Jacobi-Parochie in Friesland, at Rotterdam in Zuidholland, at Lopik in Utrecht, and at Neerbosch in Gelderland. During the third week of August, several cases of true cholera were confirmed at Rotterdam amongst the shipping population, and in the later weeks of August the presence of the disease was confirmed at several other towns in the province of Zuidholland, namely:—Sliedrecht, Stryen, Spyk on the Linge, Leerdam on the Linge, Heukelum on the Linge, Alphen on the Rhine, Delft, Maaslins and Kedichem.

During the same period cholera was also reported from several places in the province of Zeeland, especially at Hansweert, the point where the Rhine boats coming from Antwerp pass the frontier; here eleven cases of cholera, of which four were fatal, occurred during the last fortnight of August. Cases of the disease were also reported at Terneuzen on the south of the Scheldt on a vessel coming from Rotterdam, and at Oostburg also on the south of the Scheldt near the Belgian frontier. In August 38 deaths from cholera were recorded in the province of Zuidholland, and eight in the province of Zeeland. The Government, in the last week of August, officially declared the waters of the Waal, the Leck, the Dutch part of the Ijssel, the lower Linge, and the Leidenschen Rhine to be infected.

During the month of September, cholera continued to prevail in all the provinces of the Netherlands already invaded and extended to the provinces of Utrecht, Gelderland, Noordbrabant, and Overijssel. The great majority of the earlier cases are stated to have been, as in 1892, amongst persons connected with the shipping trade.

Early in October the provinces of Drenthe and Groningen were invaded by the disease. In the only remaining province, namely, that of Limburg, no cases of cholera were observed in 1893. The diffusion of cholera in the Netherlands, according to time, is illustrated in Map XVI.

Notwithstanding the widespread diffusion of cholera in the Kingdom, the disease nowhere became seriously epidemic, for, although, as in 1892,


MAP SHEWING
CHOLERA MON
HOLLAN
Provinces inv
Month of July
" " Aug
" " Sept
" " Octo
Nor
Se
3
3

Map XVII.

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about a hundred communes were invaded, the total deaths recorded were only 263, or 20 less than in 1892. The largest number of deaths reported from any one place were recorded at Rotterdam, where there were 35 deaths from cholera. In Table XXXV. is given the number of deaths from cholera recorded in the several provinces of the Netherlands during 1893, together with the mortality rates per 10,000 of the population. As no official report on the diffusion of cholera in the Netherlands in 1893 has been published, it is not possible to give reliable figures with respect to non-fatal attacks.

TABLE XXXV.

Statistics of Cholera in the several Provinces of the Netherlands during 1893.

Provinces.	Month in which Cases of Cholera first recorded in 1893.	Population.	Deaths from Cholera.	
			Number.	Rate per 10,000 Population.
Noordbrabant	July	516,670	10	*0·2*
Zuidholland	August	987,342	168	*1·7*
Zeeland	August	202,096	23	*1·1*
Noordholland	September	860,742	11	*0·1*
Gelderland	September	520,210	6	*0·1*
Utrecht	September	226,847	7	*0·3*
Friesland	September	336,442	1	*0·03*
Overijssel	September	300,493	18	*0·6*
Groningen	October	277,282	3	*0·1*
Drenthe	October	134,027	16	*1·2*
Limburg	- - - -	259,593	—	—
Netherlands	- - - -	**4,621,744**	**263**	**0·6**

From the above Table it will be seen that the mortality from cholera in the Netherlands in 1893 was 0·6 per 10,000 of the population, and that considerably more than half the deaths recorded occurred in Zuidholland, where the cholera death-rate was 1·7 per 10,000 of the population. In only two other provinces—those of Zeeland and Drenthe, where the cholera death-rates were 1·1 and 1·2 respectively—did the death-rates exceed that of the Kingdom. It may be noted that 113 deaths from "cholera nostras" were recorded in the Netherlands in 1893, and that these deaths were distributed in the several provinces as follows:—Noordbrabant, 10; Zuidholland, 15; Zeeland, 2; Noordholland, 6; Gelderland, 16; Utrecht, 3; Friesland, 3; Overijssel, 24; Groningen, 4; Drenthe, 11; and Limburg, 19.

The relative mortality from cholera in the several provinces of the Netherlands is shown graphically in Map XVII.

Roumania.

According to the official report of Dr. Felix* the Director General of the Sanitary Service of Roumania, cholera first appeared in that kingdom at Brăila, on July 7/19, when a Greek who had eaten plentifully of cucumbers and drank unfiltered Danube water was attacked by the disease and died after three days' illness. This man had been occupied, prior to his attack, in discharging coals from the British steamships "Jersey" and "Tripoli," from Cardiff. Both these vessels had arrived at Brăila with clean bills of health, and no cases of cholera occurred on either of them during their stay in Brăila. On July 13/25 and July 16/28, the mother-in-law and sister of the man already referred to were attacked by cholera, and died. His wife was not attacked. The next four cases seem to have had no connexion with the above, but the eighth case had some features of interest. It was that of an English sailor on board the British steamship "Pendarves" who was fatally attacked with cholera on July 18/30. This vessel left Port Said on July 5/17 with a crew (according to her papers) of 25 men, including the captain. She arrived at the Dardanelles on July 9/21, Constantinople on the 10/22, Sulina on the 12/24, and Brăila on the 13/25, her crew then numbering with the captain 23 only. On making inquiry as to this discrepancy, the captain stated that he had left Port Said with only 23 men, 25 being entered on his papers in error. The Roumanian authorities, however, suspected that two of the sailors had died at sea of cholera. Two workmen employed on this vessel were subsequently attacked with the disease, and, according to Dr. Felix, it was easy from this time forward to trace its communication to other labourers who lived together, took their meals together, and who one and all drank water drawn from the Danube in proximity to this vessel. The origin of the earliest cases at Brăila was not traced, but it was locally attributed to the drinking of unfiltered Danube water. From July 7/19 to October 8/20 469 persons were attacked, and of these 290, or 61·8 per cent., died, numbers equivalent to an attack-rate and a death-rate of 100·4 and 62·1 respectively per 10,000 of the census population.

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* Dare de seama asupra Epidemici de Cholera din anul 1893, presintata à lui Ministru de Interne, de Doctorul I. Felix, Director General al Serviciului Sanitar. Bucuresci 1893.

On July 18/30 cholera appeared at Islazu, a town of upwards of 5,000 inhabitants situate near Brăila in the Province of the same name; the first case there being that of a person who had come from Brăila. The disease spread there, and caused altogether 31 deaths, 51 persons being attacked.

On July 22/August 3 the first case of cholera appeared at Sulina in the Province of Tulcea, when a Turkish labourer who had been working on board the British steamship "Venice" was attacked by the disease. This vessel had left Marseilles on July 3/15, had passed through the Dardanelles and the Bosphorus in quarantine, and reached Sulina on July 15/27, to load with grain. As cholera existed at Marseilles at the time when the "Venice" left that port, the local authorities at Sulina were inclined to attribute the origin of the first case to that vessel. But, as Dr. Felix points out, this was extremely improbable, inasmuch as the journey had taken 12 days; that the "Venice," in common with 16 other vessels which arrived at Sulina between July 1/12 and July 22/August 3 from Marseilles, had been submitted to a medical examination and to measures of disinfection; and that none of them had any cases of cholera on board, whether on leaving Marseilles, or at the time of their arrival at Sulina, or during their stay there. The second case of cholera at Sulina occurred on July 23/August 4, when a Russian woman, who lived in an entirely different part of the town from the first case, was taken ill. On July 24/August 5 two more persons were attacked. Subsequently the attacks numbered on July 25/August 6, twelve, on July 26/August 7 twenty-six, on July 27/August 8 eleven, and on July 28/August 9 thirty-eight. From the latter date the daily number of cases gradually diminished until the end of September, when the epidemic ceased. From the "explosive" character of this outbreak, Dr. Felix attributed its diffusion to the specific contamination of the water of the Danube, with which Sulina is supplied.

Mr. Consul-General Sanderson, in his annual report on the trade and commerce of Galatz for the year 1893, states "that in a town like " Sulina, which has no other water supply than the Danube, it is " extremely difficult to get people to take the necessary precaution of " boiling all water for drinking purposes. In the case of a British " vessel at Sulina, some of the sailors insisted on drinking the Danube " water direct, instead of boiled and filtered water which was provided " for them, and several cases of cholera resulted. On shore there was " much the same feeling; the different directions and precautions pre" scribed by the municipality were neglected, and in many instances " cases of cholera were concealed as long as it was possible to do so." Altogether, from July 22/August 3 to the end of September, 319 persons were attacked, and of these 155 died, numbers equivalent to an attack-rate and a death-rate of 739 and 358 respectively per 10,000 of the census population. It may be pointed out that these rates are probably under-estimated, for, although before the outbreak of cholera some 2,000 workmen had, as usual at this season, come to the town, as soon as cholera broke out a panic ensued, and these men, as well as many of the ordinary inhabitants, fled.

On July 23/August 4 Cernavoda-Fetesti, in the Province of Constanța, was invaded by cholera, the first person to be attacked being the wife of a workman who had come three days before from Brăila. Here the disease spread, and up to the end of the epidemic 155 persons were attacked, and 89 died, in a population of under 3,000 persons. Here, again, the water of the Danube was regarded as the vehicle by which the disease was spread.

On July 24/August 5 cholera appeared at Galați (Galatz), when a non-fatal case occurred. The first death was certified on July 31/August 12. The origin of these cases was not traced. The disease continued to prevail in Galați up to the middle of October, and during the whole period 155 cases were recorded, of which 95, or 61·3 per cent., proved fatal. The population of Galați being about 60,000, the numbers given are equivalent to attack and death rates of 26·2 and 16·1 respectively per 10,000 of the population, much lower rates than those observed in the towns of Brăila, Sulina, and Cernavoda-Fetesti. It is to be observed in this connexion that Galați has the advantage over the places named above, of having a good supply of filtered water, and that the working classes are better housed, and that the general sanitary circumstances are superior. Almost all the persons who were attacked by cholera at Galați were found to have drunk unfiltered Danube water before being attacked by illness.

On July 31/August 12 two persons living at Tulcea (Toultcha), were attacked by cholera. These persons lived in different streets, and had no communication with the shipping, and no relation with people coming from Brăila, Sulina, or Galați. It was ascertained, however, that it had been their practice to drink Danube water which had neither been boiled nor filtered. Cholera lingered in Tulcea up to September 5/17, during which period 35 persons were attacked, and of these 27 died.

From the various centres thus formed between July 7/19, and July 31/August 12, the disease was carried by fugitives from the infected towns to numerous other places in the kingdom.

Without going into detail as to these, it may be stated that from July 7/19, the date of the first appearance of cholera in Roumania, until the end of October 1893, when the epidemic entirely ceased, 21 urban and 38 rural communes, situate in 15 provinces, had been invaded. The total number of persons recorded to have been attacked by cholera during the period in question was 1,494, and of these 872, or 58·4 per cent., died. These numbers are equivalent to an attack-rate of 5·3, and to a death-rate of 3·1 per 10,000 of the aggregate population (2,828,808) of the invaded provinces.

In Table XXXVI. the dates of invasion by cholera of the several provinces of Roumania during the year 1893 are given, together with the population and the numbers of cases and deaths recorded. In Map XVIII. the march of cholera month by month in Roumania during 1893 is shown graphically. Detailed statistics as to the several places invaded by cholera are given in Table E., appended to this report.

TABLE XXXVI.

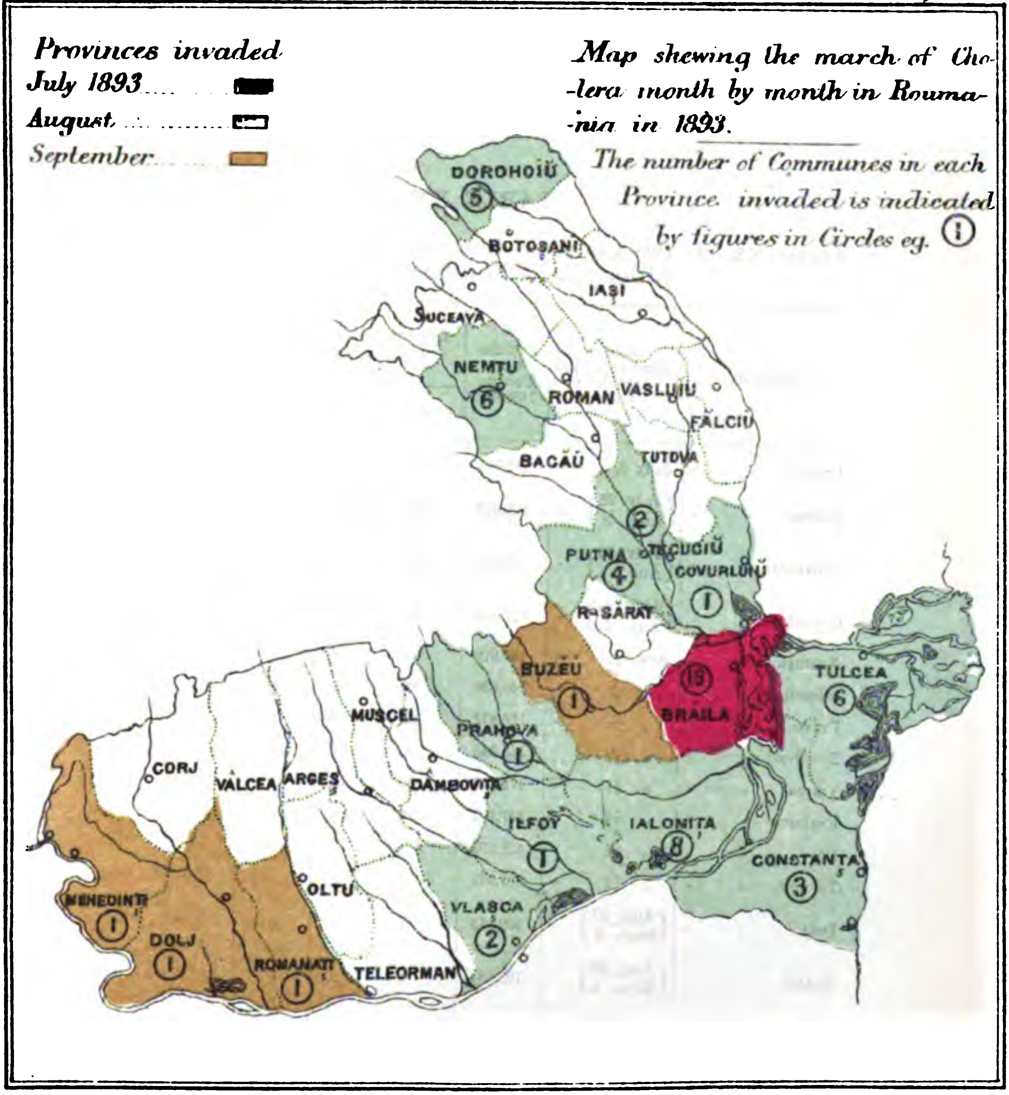
STATISTICS of the CHOLERA EPIDEMIC in the several PROVINCES (JUDEȚUL) of ROUMANIA during 1893.

Province.	Date of First recorded Attack of Cholera.	Population, Census 1889-90.	Total recorded Cholera		Rates per 10,000 of the Population, Cholera		Percentage of Deaths to Attacks, "Fatality."
			Attacks.	Deaths.	Attacks.	Deaths.	
Brăila - -	July $\frac{1}{13}$ -	118,731	591	361	*49·8*	*30·4*	*61·1*
Tulcea - -	July 22 Aug. 3 -	103,678	309	194	*35·6*	*18·7*	*62·8*
Constanța - -	July 23 Aug. 4 -	96,033	165	94	*17·2*	*9·8*	*57·0*
Covurluiŭ - -	July 24 Aug. 5 -	127,153	155	95	*12·2*	*7·5*	*61·3*
Neamțu - -	Aug. $\frac{1}{13}$ -	137,990	19	9	*1·4*	*0·7*	*47·4*
Ialomița - -	" $\frac{2}{14}$ -	146,630	82	51	*5·6*	*3.5*	*62·2*
Putna - -	" $\frac{3}{15}$ -	126,432	23	15	*1·8*	*1·2*	*65·3*
Dorohoiŭ - -	" $\frac{4}{16}$ -	135,248	46	27	*3·4*	*2·0*	*58·7*
Vlașca - -	" $\frac{14}{26}$ -	172,277	20	11	*1·2*	*0·6*	*55·1*
Prahova - -	" $\frac{16}{28}$ -	257,101	12	6	*0·5*	*0·2*	*50·0*
Ilfov - -	" $\frac{18}{30}$ -	420,591	3	2	*0·07*	*0·05*	—
Tecuciŭ - -	" $\frac{18}{30}$ -	107,072	4	3	*0·4*	*0·3*	—
Dolj - - -	Aug. 23 Sept. 4 -	302,385	1	1	*0·03*	*0·03*	—
Buzĕŭ - -	Aug. 23 Sept. 4 -	196,834	2	1	*0·1*	*0·05*	—
Romanți - -	Aug. 30 Sept. 11 -	173,398	1	1	*0·06*	*0·06*	—
Mehedinți - -	Sept. $\frac{1}{13}$	208,260	1	1	*0·05*	*0·05*	—
Total -	- - -	2,828,808	1,494	872	*5·3*	*3·1*	*58·4*

The relative mortality from cholera in the several provinces of Roumania is shown graphically in Map XIX, and the chief centres of the disease in the Kingdom in 1893 are given in Table XXXVII.

CHOLERA IN ROUMANIA 1893.

Map XVIII.



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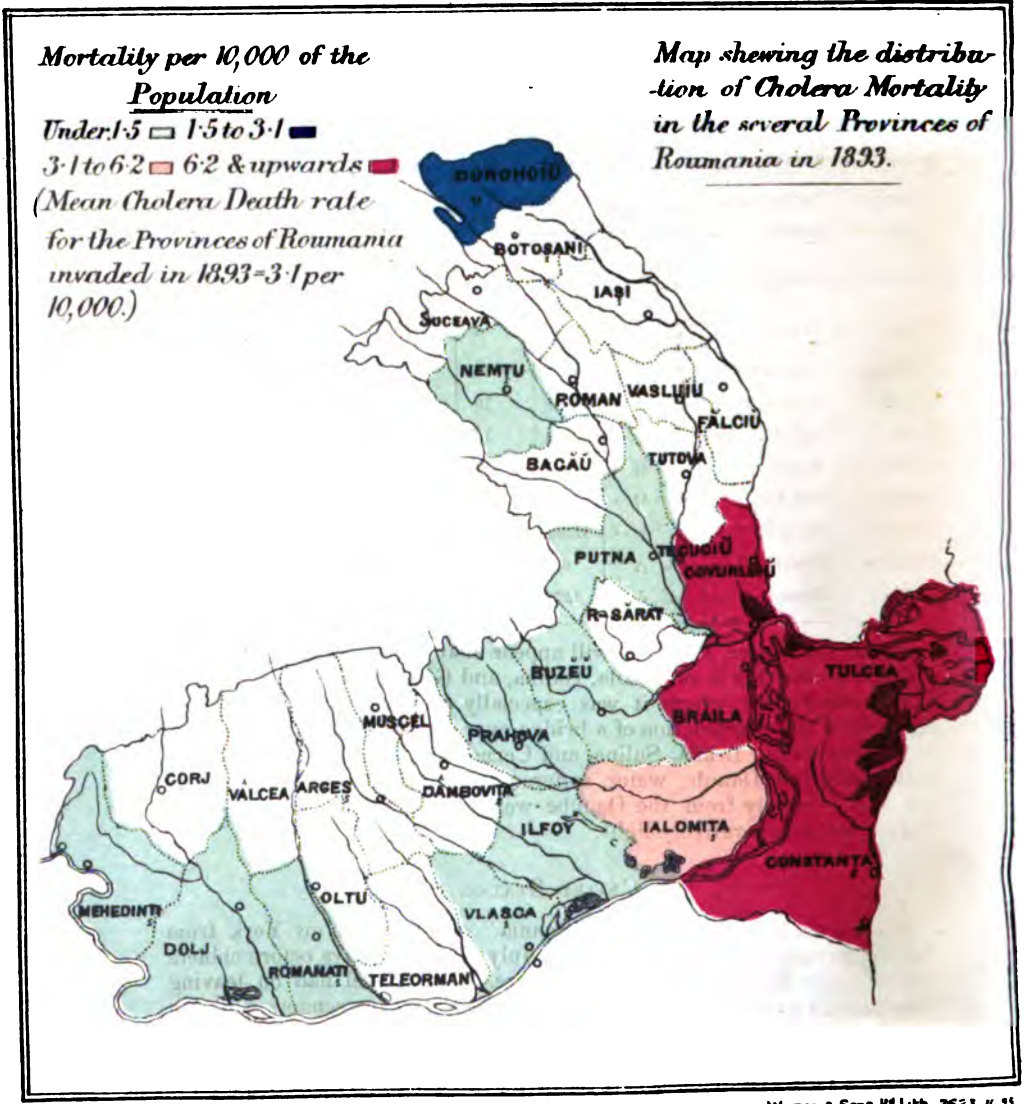
CHOLERA IN ROUMANIA 1893.

Map XIX.



Mortality per 10,000 of the Population

Under 1·5 ☐ *1·5 to 3·1* ■
3·1 to 6·2 ▨ *6·2 & upwards* 🟥
(Mean Cholera Death rate for the Provinces of Roumania invaded in 1893 = 3·1 per 10,000.)

Map shewing the distribution of Cholera Mortality in the several Provinces of Roumania in 1893.

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TABLE XXXVII.

Showing the several Towns and Villages situate in Roumania in which Cholera was exceptionally prevalent during 1893.

Province.	Town or Village (Names of Municipal Towns printed in Small Capitals).	Date of First recorded Case of Cholera.	Population, Census 1889-90.	Number of recorded Cholera		Rates per 10,000 of the Population, Cholera		Deaths per cent. of recorded Attacks "Fatality."
				Attacks.	Deaths.	Attacks.	Deaths.	
Brăila -	BRĂILA -	July 7/19 -	46,715	469	290	100·4	62·1	61·8
" -	Islazu - -	" 11/23 -	5,162	51	31	98·9	60·2	60·8
Tulcea -	SULINA -	July 22/Aug. 3	4,317	319	155	739·0	358·8	59·9
Constanţa	CERNAVODA -	July 23/Aug. 4	1,553	155	89	556·0	319·5	57·5
Ialomiţa -	Fetesti -		1,236					
Covurluiŭ	GALAȚI -	July 24/Aug. 5	59,143	155	95	26·2	16·1	61·3
Tulcea -	TULCEA -	July 31/Aug. 12	17,257	35	27	20·3	15·6	77·2
Ialomiţa -	CĂLĂRAȚI -	Aug. 3/15 -	8,125	32	21	39·4	25·9	65·6
Dorohoiŭ -	HERTA -	" 6/18 -	2,919	19	11	65·1	37·7	57·9
Putna -	Sascut -	" 7/19 -	2,414	14	9	58·0	37·3	64·4
Dorohoiŭ -	Movila -	" 11/23 -	1,511	19	12	99·5	62·8	63·2
Ialomiţa -	Pira Petri -	" 11/23 -	1,578	18	11	114·0	69·6	61·1
Vlaşca -	GIURGIU -	" 12/24 -	12,559	19	10	15·1	8·0	52·6
Ialomiţa -	Vlădeni -	Oct. 2/14 -	984	15	9	152·2	91·4	60·0
Brăila -	Gropeni -	" 7/19 -	1,956	24	11	122·6	56·2	45·8

From the above Table it will appear that cholera was most widely diffused in the Ports of Brăila, Sulina, and Galati, and in the town of Cernavoda-Fetesti, where it was especially prevalent amongst persons engaged in the construction of a bridge over the Danube. In proportion to the population Brăila, Sulina, and Cernavoda-Fetesti, places supplied with unfiltered Danube water, suffered most; whilst at Galati, where the water supply from the Danube was filtered, the incidence of the disease was comparatively light.

United States.

On August 3rd, the S.S. "Karamania" arrived at New York from Naples, having left the latter port on July 15th, two days before cholera was officially declared to be present there. This vessel had on leaving Naples, 524 persons on board, of whom 471 were passengers, and the remainder officers and crew. When boarded by the Health Officer at New York, it was found that three deaths had occurred during the voyage. Of these the first had taken place on July 17, two days after leaving Naples, the cause of death being stated to be "congestion of the lungs," this patient had, however, suffered from diarrhœa before death. The other two deaths occurred early on August 3rd, and in both persons the symptoms were suspicious of cholera. It was also ascertained that there had been several cases of diarrhœa on board between July 17th and August 1st. The "Karamania" was accordingly ordered into

App. A. No. 16.
On the Western Diffusion of Cholera in 1893; by Dr. Barry.

quarantine, and the passengers transferred to Hoffman Island. On August 5th, one of the passengers who developed symptoms suspicious of cholera was removed to Swinburne Island, where he subsequently recovered. On August 8th and on August 9th two more persons were attacked with cholera, and were removed to Swinburne Island, where they died. Five more passengers were attacked with suspicious illness, and removed to Swinburne Island on August 11th, and these were followed by ten on August 12th, and two on August 13th. Of the total 23 persons isolated on Swinburne Island, four died, and, in all the cases, with three exceptions, the presence of Koch's comma bacillus was demonstrated. The last death occurred on August 19th, and the passengers were finally transferred to Ellis Island, whence they were released from quarantine on August 22nd. The vessel was allowed to discharge her cargo on August 14th, after having been thorougly disinfected and repainted. The crew, however, were kept under strict observation and not allowed to go on shore. No further cases of cholera were reported with respect to this vessel.

On October 8th, the S.S. "Russia" arrived at New York with immigrants from Hamburg. This vessel which had left Hamburg on September 24th, had had five deaths amongst the passengers during the voyage, and of these four had died with symptoms suspicious of cholera. At the time of her arrival at New York, there were on board in addition two cases of illness which were subsequently found from bacteriological examination, to be indistinguishable from true cholera. This vessel was placed in quarantine, and the passengers 408 in number, showing no suspicious symptoms, were removed to Hoffman Island, the two suspicious cases being isolated on Swinburne Island where one died. No further case was reported, and the cabin passengers, 41 in number, were released from quarantine on October 12th. The steerage passengers were bathed, and their effects disinfected before being discharged from quarantine.

The first case of cholera on land in the United States occurred at Jersey City on August 20th, when a coloured man who had been indulging freely in crabs and beer the previous day, was admitted to the Jersey City Hospital, suffering from symptoms suspicious of cholera; he died there on the following day (August 21). This case was followed between August 21st and August 30th by seven other cases all of which proved fatal. All these persons had either eaten crabs at a supper at which the first person attacked was present, or were relatives of persons attacked. The presence of the comma-bacillus of Koch was demonstrated in all these cases, but no conclusion was formed as to the means by which the disease had been transmitted. No further cases were reported in the United States during 1893.

The total cases of cholera recorded as having occurred in 1893 in the United States were 33 in number, and of these 13 were fatal. They were distributed as follows:—

New York Bay:			
	S.S. Karamania,	23 attacks,	4 deaths.
	S.S. Russia -	2 „	1 death.
New Jersey City - -		8 „	8 deaths.

EGYPT.

In my report on cholera in the Ottoman Empire in 1893,* I have already referred to the fact that a number of pilgrims from Mecca suffered from cholera at the Egyptian Quarantine Station of El Tor. The total number of pilgrims who performed quarantine at El Tor in 1893 was 29,310, and of these 132 were attacked, and 99 died of cholera. In addition to the cases amongst the pilgrims, a few cases were recorded amongst the sanitary staff, soldiers, and the inhabitants of the villages of Tor, Jebel, Ras, Mallap, and Mainoun. According to a report by Dr. Mackie, C.M.G., enclosed in a despatch from Sir Charles Cookson, dated September 25th, it appears that the sanitary staff at El Tor numbered 411 persons, the military guards 800, and the inhabitants of the villages about 300 or 1,511 altogether. On August 3rd the first case of cholera outside the pilgrims was declared in the person of a bashi basouk acting as a policeman in the village of Tor; on August 16th there were six cases in Tor; further cases were recorded from time to time until September 18th when the last case occurred. The total cases recorded outside the pilgrim's encampment were 24 in number.

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* See page 273, *ante*.

No case of cholera was recorded in any other part of Egyptian territory in 1893.

Brazil.

On August 12th cholera appeared at San Paulo amongst some Italian emigrants at the "imimigrant station," who had been brought by the vessels "Umberto" and "Colonna," which had left Genoa on July 1st and July 2nd respectively. Between August 12th and 18th 22 deaths from cholera were recorded as having taken place amongst these immigrants. After August 18th no further cases were reported. On August 22nd cases suspicious of cholera were reported to have occurred at Rio, but these were not confirmed to be cholera.

Tripoli.

On August 15th the steamship "Afghan" arrived at Tripoli with some 700 pilgrims who had come from Mecca. These pilgrims had been subjected to quarantine at El Tor, but several deaths from cholera were reported to have occurred during the voyage from Suez to Tripoli. On their arrival at Tripoli they were subjected to a further quarantine of 10 days. During the first four days there was no case of choleraic illness, but on August 20th a person was attacked by the disease, he died on August 22nd, and there was a second fatal case the following day; subsequently two further cases occurred, which, however, were not fatal.

On September 21st a further batch of pilgrims from Mecca was brought by the "Afghan," and of these four died in the lazaretto from cholera. In November cholera again appeared at Tripoli, this time amongst the soldiers of the garrison, having been imported by recruits coming from infected districts of the Ottoman Empire. At the military lazaretto from November 21st to November 30th 52 attacks from cholera were recorded of which 26 proved fatal. Five further deaths were reported to have taken place in December amongst the soldiers of the garrison.

Morocco.

On August 21st 300 pilgrims on their return from Mecca by the French steamship "Lutetia" were landed on a small island in the Bay of Mogador to undergo a quarantine of 10 days. Three hours after being landed two of the pilgrims died from cholera, and subsequently 15 cases occurred, of which 6 were fatal. Further batches of pilgrims continued to arrive, until on Sepember 4th there were some 1,600 pilgrims confined in the lazaretto, whilst 2,000 Arabs who had come to meet the pilgrims were encamped at Mogador. Between August 22nd and September 5th 52 persons were attacked with cholera, and of these 15 died. After September 5th no further spread of the disease was recorded to have taken place in Morocco.

SPAIN.

Notwithstanding the prevalence of cholera in France in 1892, no cases of the disease were apparently imported into Spain during that year, and the Peninsula remained free from cholera until the autumn of 1893, when it appeared in the province of Viscaya (Biscay). No complete account of the prevalence of cholera in Spain in 1893 has yet been published, but, through the courtesy of his Excellency the Spanish Ambassador, I am enabled to give the dates of invasion of the places earliest infected, as well as the statistics of the epidemic in so far as it affected the province of Viscaya. According to the official statement, two women living at Deusto, a small town situate at the mouth of the River Nervion, were attacked with symptoms suspicious of cholera early in August, but for a month afterwards no further cases were observed, and it is somewhat doubtful whether these were cases of true cholera or not.

On September 4th the presence of cholera was confirmed at the important port of Bilbao, and also at Baracaldo, a town situate on the River Nervion below Bilbao, and on September 5th cases of cholera were observed at Deusto. Upon an examination of the dejecta of some of these cases, the presence of the comma-bacillus of Koch was demonstrated by Dr. Mendoza, of Madrid. The origin of the infection in these cases was not traced. Cholera continued to spread, and an important centre was early formed at Zabballa, a suburb of Baracaldo, having a population of some 200 persons, where, in the course of three weeks, 34 persons were attacked, and of these 12 died. The suburb of Zabballa is situate on a hill some distance from the River Nervion, and is built upon recent river alluvium of a very permeable character, and the spread of cholera in the place was locally attributed to the condition of the subsoil. Another centre was formed at Erandio (population 2,931), a place situate on the opposite bank of the River Nervion to Baracaldo. This place was invaded on September 17th, and between that date and the end of the month 26 persons were attacked, of whom 11 died. At Bilbao (population 50,772), where, as already stated, the presence of cholera was confirmed on September 4th, 130 persons were attacked by the disease before the end of the month, and of these 68 died. Several fresh centres of cholera were formed during September in the province of Viscaya, especially in the neighbourhood of Bilbao, and it is noteworthy that the more important of these were almost all situate on the River Nervion below Bilbao; for example, Las Arenas, Lejona, Ortuella, Portugalete, San Salvador del Valle, Sauturce, and Sestao. Towards the end of the month cholera extended to the iron-ore mining district near Somorrostro.

During the month of September the number of attacks and deaths officially recorded to have taken place in the province of Viscaya were 486 and 215 respectively. During the first fortnight of October the disease continued to spread. On October 15th, in consequence of Koch's comma-bacilli being found in the water of the River Nervion, the use of that water for drinking purposes was prohibited. During the later weeks of October the number of fresh cases recorded daily decreased rapidly, and by November 3rd the epidemic was declared to be at an end.

The total number of cases of cholera recorded to have occurred in the province of Viscaya during the epidemic was 1,117, of which 473, or 42·3 per cent., proved fatal; the population of the province being 235,659, these numbers are equivalent to an attack-rate of 4·7 and a death-rate of 2·0 per 10,000 of the population.

The chief centres of the disease in the province of Viscaya in 1893 are given in Table XXXVIII.

TABLE XXXVIII.

Showing the several Towns and Villages situate in the Province of Viscaya in which Cholera was Exceptionally Prevalent during 1893.

Town or Village.	Date of First recorded Case of Cholera 1893.	Population, Census 1887.	Number of recorded Cholera		Rates per 10,000 of the Population.		Deaths per Cent. of recorded Attacks. "Fatality."
			Attacks.	Deaths.	Attacks.	Deaths.	
Bilbao - -	Sept. 4th	50,772	363	198	*71·5*	*39·2*	*54·6*
Baracaldo - -	„ 4th	1,708	103	34	*605·0*	*199·6*	*33·0*
Deusto - -	„ 5th	2,972	38	19	*127·8*	*63·9*	*50·0*
Sestao - -	„ 10th	4,374	59	29	*134·8*	*66·3*	*49·2*
Santurce (Ortuella) -	„ 14th	5,360	79	38	*147·4*	*70·9*	*48·1*
Erandio - -	„ 17th	2,931	48	16	*163·8*	*54·6*	*33·3*
San Salvador del Valle.	„ 17th	5,114	28	16	*54·8*	*31·3*	*37·2*
Portugalete -	„ 18th	2,412	10	7	*29·3*	*30·5*	*70·0*
Abanto-y-Ciérvana -	„ 19th	1,975	29	8	*628·0*	*228·0*	*36·3*
„ (Arboleda)	„ 29th		48	25			
„ (Gallarta)	„ 29th		47	12			
Musques - -	„ 27th	1,681	33	9	*196·2*	*53·5*	*27·3*

On September 8th cholera appeared at Belchite (population 3,346), a town situate south of Zaragoza, in the province of Zaragoza. Here the disease was probably introduced by an officer, who, on his return from the South of France, was attacked by cholera, and died after a short illness. Almost immediately afterwards a lady, who had been bedridden for some time, but who was attended by the same medical man as the officer, was also attacked by, and died of, the disease; and a priest, who administered the last Sacraments to both persons, likewise suffered from Asiatic cholera. A few further cases occurred at Belchite, but the disease did not become epidemic, the total number of persons affected between September 8th and September 16th being 15, of whom six died.

Cholera was imported from Bilbao to Zumarraga (population 1,867), Villarreal (population 1,076), and Urnieta (population 1,793), in the neighbouring province of Guipúzcoa where 6 deaths, 4 deaths, and 3 cases respectively, were recorded. One death from cholera was recorded in September at Vitoria (population 27,660), in the province of Alava.

The total cases and deaths recorded in the invaded provinces of Spain during 1893 were as follows:—

Province.	Population.	Cholera	
		Attacks.	Deaths.
Viscaya - - - - - -	235,659	1,117	473
Zaragoza - - - - - - -	415,195	15	6
Guipúscoa - - - - - -	181,845	16	11
Alava - - - - - -	92,915	1	1
Totals - - -	925,614	1,149	490

SERVIA.

According to a despatch from Her Majesty's Minister at Belgrade, four cases of cholera, of which three proved fatal, occurred at Belgrade between the 9th and 12th September. No further cases were reported to have occurred in Servia during 1893.

SWEDEN.

On September 27th a young lady, who had left Stockholm the previous day on board the steamship "Thule," was attacked with cholera at Umea,* and died on September 30th in the hospital there. Between October 3rd and 8th three further cases suspicious of cholera occurred at the hospital at Umea, in the persons of an attendant, the cook, and one of the patients. The origin of the infection of the first case was not traced.

On October 1st a case of cholera was notified at Gothenburg† on board the steamship "Olof Wijk," on her arrival from Antwerp, where cholera prevailed.

No further cases of cholera were reported to have occurred in Sweden during 1893.

CANARY ISLANDS.

On October 2nd a case of cholera occurred at Santa Cruz de Tenerife, in the person of a man who had been engaged in coaling the Italian ss. "Remo." This vessel had sailed from Genoa for Rio de Janeiro in the second week in August, having on board a general cargo and Italian emigrants. During the voyage cholera and typhus fever broke out. On reaching Rio de Janeiro in the first week of September, the Port Authorities refused to allow any communication between the ship and the shore, and she set sail again for Europe. On September 29th the "Remo" called at Santa Cruz de Tenerife for coal and fresh water. The Medical Officer of the Port visited her and ascertained that there had been 123 cases of cholera, of which 37 had proved fatal since the departure of the vessel from Genoa. The ship was immediately ordered to proceed to the quarantine station, 4 miles south of the town, and anchor there. Coal and fresh water were supplied to her, with the

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* Despatch from H.M. Minister at Stockholm, dated October 6th, 1893.

† Despatch from H.M. Consul at Gothenburg, dated October 7th, 1893.

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On the Western Diffusion of Cholera in 1893 by Dr. Barry.

strictest precautions against possible infection. Coal was taken on board in bags from barges alongside. Each bag that reached the deck of the ship remained on board, and was carried away in the vessel. The bags were slung on board at the end of an iron chain, which was the only article on board the ship which was touched by the men on the barges. The water was pumped from water barges by means of a hose belonging to the barges, and this hose, at the termination of the work, was cut off close to the barge and carried away by the ship. As an additional precaution, the captain of the "Remo" was ordered to prevent any water, refuse, or dejecta from being thrown overboard until he was well out at sea, but how far this order was complied with is unknown. At sundown all the work was stopped, and the "Remo" left at once.

As has already been stated, one of the men engaged in the work of coaling this vessel is known to have suffered from cholera on October 2nd, or within three days of the "Remo's" visit. This man recovered, but a woman who nursed him died from cholera two or three days later. These cases occurred in the south quarter of the town. Other cases followed, and a large number of the inhabitants fled to the country, with the result that the disease also appeared in many villages. The official statistics do not take account of any cases that occurred prior to October 14th.

In the following table are given the official statistics of the cholera cases and deaths recorded in the town of Santa Cruz de Tenerife (population 19,722) from October 14th, 1893, to the end of the epidemic:—

Period.	Cholera	
	Cases.	Deaths.
October 14th to 31st - - - - - -	19	10
Week ended November 7th - - - - - -	17	16
" " 14th - - - -	59	36
" " 21st - - - - - -	284	50
" " 28th - - - - -	399	71
" December 5th - - - - - -	337	53
" " 12th - - - - -	167	33
" " 19th - - - - - -	59	13
Totals - - - -	1,578	282

The highest number of cases registered in one day was 83, on November 26th, and the highest number of deaths, 14, was reached on two days of the same week.

In addition to the cases recorded at Santa Cruz de Tenerife, 189 cases occurred at the Lazaretto, of which 67 proved fatal, and at Regla, a church which was turned into a lazaretto, 60 patients were treated, of whom 22 died. At San Andres, a village five miles north of Santa Cruz, there were 40 deaths from cholera. The epidemic was officially declared to be at an end on December 17th, the total deaths being notified to have been 411 in number.

For the foregoing account of cholera in the Canary Islands, I am mainly indebted to a paper on the subject by Mr. H. A. Cruttwell, published in the "Lancet."*

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* The Cholera Epidemic in Teneriffe, by H. Athill Cruttwell.—The "Lancet," Vol. I., 1894, pp. 112 and 231.

This outbreak in the Canary Islands is peculiarly interesting, as it shows the futility of even the strictest quarantine regulations to prevent the entrance of cholera even into a small isolated island such as Teneriffe.

As for the manner in which the disease spread in Santa Cruz, little information has reached this country, but according to a report of Her Majesty's Consul it would appear that the water supply of the town was liable to contamination, the water being conveyed in stone channels, which at certain points had become damaged, and thus allowed the entrance of sewage. Since the epidemic iron pipes have been substituted for the stone conduits.*

Bulgaria.

On October 12th two cases of cholera were reported to have occurred at Toutrakau, a small village in the neighbourhood of Roustchouk, and one at Roustchouk itself. On October 17th Her Majesty's Consul-General at Sofia reported that, in consequence of the outbreak at Toutrakau, that village had been isolated and surrounded by a military cordon. Further cases occurred at Toutrakau, and up to October 22nd eight persons had been attacked, and of these six had died. The disease spread to the village of Kadikieu, situate to the east of Toutrakau, where three persons, members of one family, were attacked, and of these two died. No further cases were reported from Bulgaria in 1893.

I have now in three of the Medical Officer's Supplements† to the Board's Annual Reports studied the behaviour of cholera during the course of the great Western diffusion in recent years, and, as the outcome of this study, it appears to me that the following inferences are justified:—

1st. This diffusion of cholera from one place or country to another has invariably followed lines of human intercourse.

2nd. Increased facilities for steam communication by land and by water, especially between Central Asia and Europe, have conduced to a rapidity in the diffusion of cholera hitherto unprecedented.

3rd. Cholera, in its progress by way of river traffic, has fastened on more centres of population than when its diffusion has taken place over land.

4th. All "explosions" of cholera, as to which detailed evidence has been forthcoming, have been found, on investigation, to have been referable to specifically polluted water supplies.

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* Report for the year 1893 on the Trade and Sanitary Condition of the Canary Islands. [C. 7293.—25.] 1894.

† Report on the Origin and Progress of the Western Diffusion of Cholera during the year 1892. Supplement to the 22nd Annual Report of the Local Government Board, 1892–93.

Report on Cholera in Germany during the Winter of 1892–93. Supplement to the 23rd Annual Report of the Local Government Board, 1893–94.

Report on the Western Diffusion of Cholera during the year 1893. Supplement to the 24th Annual Report of the Local Government Board, 1894–95.

DETAILED TABLES appended to DR. BARRY'S REPORT.

[*In these Tables, rates taken on single deaths are placed in square brackets.*]

TABLE A.

CHOLERA in the GERMAN EMPIRE, from May 27th to December 31st, 1893.

County (Kreis) or County Town (Stadt Kreis).	Place.	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population. 1893.
				Attacks.	Deaths.	
STATES OF HAMBURG:						
Hamburg	City and suburbs	May 27	569,260	129	61	*1·07*
	Country district	Sept. 25	53,270	4	3	*0·6*
	PRUSSIA.					
CITY OF BERLIN:						
Berlin	Berlin	Aug. 3	1,578,794	18	9	*0·06*
GOVERNMENT DISTRICT OF DÜSSELDORF:						
Duisburg (town)	Duisburg (town)	„ 20	47,519	3	3	*0·6*
Neuss	Neuss	„ 21	23,694	3	3	*1·2*
	Heerdt	Sept. 22	1,171	1	1	[*8·5*]
Mörs	Homberg	Aug. 22	5,099	1	1	[*2·0*]
Ruhrort	Meiderich	„ 24	21,417	3	2	*0·9*
	Wanheim	Sept. 2	727	3	1	[*13·6*]
Rees	Emmerich	Aug. 27	9,622	2	2	*2·1*
Solingen	Papiermühle	„ 31	78	12	5	*641·0*
	Sturmsloch	Sept. 2	26	2	—	*769·0*
	Solingen	„ 8	31,926	1	—	—
	Schleif Kotten No. 3	„ 12	—	1	—	—
Mettmann	Sudberg	„ 3	347	1	1	[*28·8*]
	Unter-Kohlfurt	„ 7	88,62	1	—	—
GOVERNMENT DISTRICT OF KOBLENZ:						
Neuwied	Neuwied	Aug. 25	11,062	1	1	[*0·9*]
Mayen	Andernach	„ 28	6,153	3	—	—
Sankt Goar	Sankt Goar	Sept. 7	1,468	1	1	[*6·8*]
GOVERNMENT DISTRICT OF WIESBADEN:						
Rheingau	Geisenheim	Aug. 25	3,141	1	1	[*3·2*]
GOVERNMENT DISTRICT OF BROMBERG:						
Bromberg	Schulitz	„ 25	2,181	1	1	[*4·4*]
GOVERNMENT DISTRICT OF KÖLN:						
——	Rhein, near Bonn	„ 27	—	1	1	—
Köln (town)	Köln (town)	Sept. 1	281,273	2	2	*0·07*
GOVERNMENT DISTRICT OF MARIENWERDER						
Marienwerder	Weichsel, near Fiedilitz.	„ 8	—	1	1	—
Briesen	Piwnitz	Nov. 7	1,138	1	1	[*8·8*]

County (Kreis) or County Town (Stadt Kreis).	Place.	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Government District of Schleswig:						
Altona (town)	Altona (town)	Sept. 16	143,249	15	9	0·6
Steinburg	Itzehoe	„ 20	12,481	2	1	[0·8]
Kiel (town)	Kiel (town)	„ 22	69,172	11	3	0·4
Eiderstedt	Tönning	Oct. 19	3,228	1	1	[3·1]
Rendsburg	Osterrade	Nov. 3	417	1	1	[24·0]
Government District of Hannover:						
Hameln	Bodenwerder	Sept. 20	1,524	3	2	13·1
Government District of Stettin:						
Stettin (town)	Stettin (town)	„ 22	113,421	89	44	3·9
Greifenhagen	Sydowsaue	„ 27	603	1	1	[16·6]
	Greifenhagen	Nov. 9	6,694	1	—	—
Randow	Altdamm	Oct. 4	5,241	1	1	[1·9]
	Grabow	„ 5	15,703	5	4	2·5
	Warsow	„ 7	1,223	20	11	89·9
	Bollinken	„ 9	507	1	1	[19·7]
	Kratzwiek	„ 10	278	4	3	108·0
	Pölitz	„ 10	4,009	3	3	7·5
	Bredow	„ 13	13,835	3	3	2·2
	Frauendorf	„ 13	2,741	4	1	[3·7]
	Mescherin	„ 21	785	3	—	—
	Stöwen	„ 23	429	2	2	46·6
	Gartz-on-Oder	„ 26	4,431	14	6	13·5
Kammim	Gr. Stepenitz	„ 9	1,600	6	5	31·2
Ueckermünde	Eggesin	„ 17	2,200	1	1	[4·5]
	Bellin	Nov. 21	520	2	1	[19·2]
Usedom-Wollin	Wollin	Oct. 25	4,967	10	3	6·2
	Swinemünde Harbour	„ 26	476	1	1	[21·0]
Naugard	Gollnow	Nov. 2	8,472	11	9	10·6
	Lübzin	„ 19	1,765	1	—	—
Government District of Potsdam:						
Angermünde	Schwedt	Sept. 23	9,756	1	1	[1·0]
	Neuensoll bei Hohensaathen.	Oct. 26	1,019	1	1	[9·8]
	Niederfinow	„ 27	1,050	8	2	19.1
	Werbellin	Nov. 21	400	1	1	[25·0]
Westprignitz	Wittenberge	Oct. 10	12,590	4	3	2·4
	Havelberg	„ 12	7,277	34	17	23·4
	Toppeln	„ 26	178	1	—	—

County (Kreis) or County Town (Stadt Kreis).	Place.	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Niederbarnim	Kienitz	Oct. 18	715	4	1	[14·0]
	Zerpenschleuse	„ 22	1,800	2	—	—
	Finow Canal, near Zerpenschleuse.	„ 25	—	1	1	—
	Malzer Canal, near Oranienburg.	Nov. 24	—	1	1	—
	Boss Canal, near Libenwalde.	„ 25	—	1	—	—
	Cholera Hospital, Bischofswerder.	—	—	1	—	—
Potsdam (town)	Potsdam (town)	Oct. 25	56,000	3	2	0·4
Westhavelland	Mögelin	„ 27	380	1	1	[26·3]
	Zachow	Nov. 4	400	1	1	[25·0]
	Rathenow	„ 5	16,000	1	1	[0·6]
	Bagow	„ 6	290	1	—	—
Templin	Grunewald	Oct. 31	600	1	—	—
Oberbarnim	Eberswalde	Nov. 7	16,114	1	1	[0·6]
	Sophienhaus	„ 7	50	1	—	—
	Heegermühle	„ 8	2,377	1	1	[4·2]
Zauch-Belzig	Werder	„ 12	5,912	1	1	[1·7]
	Götz	„ 20	500	1	1	[20·0]
Ruppin	Gransee	„ 16	3,967	4	2	5·1
Government District of Stade:						
Geestemünde	Geestemünde	Sept. 25	15,452	1	—	—
Kehdingen	Neuland	„ 30	1,235	1	—	—
Jork	Neuenfelde	Oct. 8	1,814	1	1	[5·5]
Government District of Aurich:						
Weener	Kirchborgum	Sept. 5	318	1	1	[31·4]
Government District of Frankfurt:						
Königberg in Neumark.	Oder, near Alt-Drewitz.	„ 27	—	2	2	—
	Nieder-Hohen-Kränig.	Oct. 2	456	3	2	43·9
	Niedersaathen	„ 8	317	7	3	94·5
	Neu-Schaumburg	„ 11	135	1	1	[74·0]
	Küstrin	„ 13	16,000	1	1	[0·6]
	Oder, near Niederwutzow.	„ 18	—	1	1	—
	Brailitz	Nov. 12	1,500	1	1	[6·7]
	Göritz	Oct. 27	2,580	1	—	—
Lebus	Fürstenwalde	Nov. 23	13,286	1	—	—

County (Kreis) or County Town (Stadt Kreis).	Place.	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
GOVERNMENT DISTRICT OF MAGDEBURG:						
Magdeburg (town)	Magdeburg (town)	Oct. 7	202,234	3	2	*0·1*
Stendal	Stendal	„ 26	18,472	1	—	—
GOVERNMENT DISTRICT OF LÜNEBURG:						
Dannenberg	Damnatz	„ 13	338	1	—	—
	Hitzacker	„ 29	1,018	1	1	*[9·8]*
Harburg	Altenwerder	„ 15	1,945	1	1	*[5·1]*
Harburg (town)	Harburg (town)	Nov. 5	34,835	1	1	*[0·3]*
GOVERNMENT DISTRICT OF GUMBINNEN:						
Tilsit	Tilsit	Oct. 17	24,545	17	8	*3·3*
Ragnit	River Memel, near Bambe.	„ 18	—	1	—	—
	Ragnit	„ 20	3,956	1	1	*[2·5]*
Niederung	Andreischken	„ 22	151	3	1	*[66·2]*
	Endreischken	Nov. 3	69	1	1	*[145·0]*
GOVERNMENT DISTRICT OF DANZIG:						
Danzig (town)	Danzig (town)	Oct. 20	120,338	1	—	—
GOVERNMENT DISTRICT OF OPPELN:						
Tost-Gleiwitz	Gleiwitz	„ 24	19,667	1	1	*[0·5]*
	Trynnek	Nov. 14	3,887	4	1	*[2·6]*
Kattowitz	Städtisch - Janow, near Myslowitz.	Dec. 27	9,388	3	2	*2·1*
Buthen (town)	Buthen (town)	Jan. 2-94	36,905	1	1	*[0·3]*
Zabrze	Klein Zabrze	„ 11-94	6,658	3	1	*[1·5]*
GOVERNMENT DISTRICT OF LIEGNITZ:						
Freistadt	Oder, near Neusalz	Oct 28	—	1	1	—
GOVERNMENT DISTRICT OF KÖNIGSBERG:						
Labiau	Gilge	Nov. 2	1,701	1	1	*[5·9]*
	Nemonien	„ 2	1,209	3	2	*16·6*
Osterode	Liebemühl	„ 3	2,149	1	—	—
	Moerlen	„ 6	198	1	1	*[50·6]*
GRAND DUCHY OF BADEN:						
Donaueschingen	Donaueschingen	Aug. 15	3,594	1	1	*[2·8]*
Mannheim	Mannheim	„ 31	79,058	1	—	—

Table B.

Cholera in the Austro-Hungarian Empire in 1893.

(1.) Austria.

(a.) *Cholera attributed to infection from the* 1892 *epidemic.*

Department.	Town or Village.	Date of		Population.	Total recorded Cholera.		Cholera Death-rate per 10,000 Population, 1893.
		First recorded Case of Cholera. 1893.	Last recorded Case of Cholera, 1893.		Attacks.	Deaths.	
			Province of Galizien.				
Borszczów	Nowosiolka	1892 April 7	Jan. 19 April 13	1,267	13 2	9 1	*79·1*
	Zalucza	Jan. 1 Mar. 7	Jan. 3 Mar. 27	652	2 8	2 2	*61·3*
	Wierzbowka	Jan. 5	Jan. 7	562	2	2	*35·6*
	Slobudka Turylecka	Jan. 9 April 9	Jan. 9 April 20	889	2 4	— 2	*51·4*
	Kudrynce	Jan. 13 Mar. 29	Feb. 27 April 27	2,601	8 24	5 16	*80·7*
	Boryszkowce	Jan. 17	Jan. 22	1,173	3	1	[*8·5*]
	Podfilipie	Jan. 20 April 21	Jan. 20 April 21	360	1 1	1 —	[*27·8*]
	Skala	Jan. 22	Jan. 22	6,507	1	1	[*1·5*]
	Paniowce	April 7	April 7	1,498	1	—	—
	Cygany	„ 10	„ 10	2,022	1	1	[*4·9*]
	Zawale	„ 10	„ 10	269	1	1	[*37·2*]
	Losiacz	„ 15	„ 15	2,019	1	1	[*4·9*]
				19,319	70	45	*23·3*
Husiatyn	Siekierzynce	Jan. 7	Jan. 7	827	1	1	[*12·1*]
	Zielona	„ 7	„ 7	712	1	—	—
	Kociubince	„ 30	„ 10	2,492	1	1	[*4·0*]
				4,031	3	2	*4·9*
Buczacz	Buczacz	April 23	April 23	1,1096	1	1	[*0·9*]
Tarnopol	Smykowce	„ 23	„ 23	754	1	—	—

Table B.—(1.) Austria—*continued.*

(b.) *Cholera attributed to new Importation of the Disease in* 1893.

Department.	Town or Village.	Date of		Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
		First recorded Case of Cholera, 1893.	Last recorded Case of Cholera, 1893.		Attacks.	Deaths.	
	Province of Galisien.						
Nadwórna -	Mikuliczyn -	Aug. 3	Oct. 20	3,295	72	44	*133·5*
	Jamna -	„ 9	„ 25	803	10	7	*87·2*
	Delatyn -	„ 10	„ 20	5,274	112	75	*142·2*
	Jablonica -	„ 11	„ 11	1,405	23	16	*113·9*
	Dobrotów -	„ 13	„ 17	1,244	56	31	*249·2*
	Dora - -	„ 16	Aug. 21	1,945	2	2	*10·3*
	Nadwórna -	„ 20	Oct. 26	7,341	49	38	*51·8*
	Zarzécze -	„ 24	Sept. 12	2,992	6	4	*13·4*
	Krasna -	„ 29	Oct. 5	2,016	32	11	*54·6*
	Lanczyn -	Sept. 1	Nov. 6	3,507	8	3	*8·6*
	Hwozd -	„ 2	Oct. 10	1,958	57	27	*137·9*
	Wolosów -	„ 5	„ 21	1,092	8	6	*54·9*
	Cucylow -	„ 10	Sept. 14	870	3	1	[*11·5*]
	Pniów	„ 10	Oct. 2	4,374	14	12	*27·4*
	Luh - -	„ 24	Sept. 24	779	1	—	—
	Fitków -	„ 27	„ 27	710	1	—	—
	Osláwybiale -	„ 27	Nov. 3	2,491	4	3	*12·0*
	Nazawizow -	Oct. 7	Oct. 26	974	6	6	*61·6*
				43,070	464	286	*65·3*
Rawa ruska	Belzec -	Aug. 5	Aug. 5	1,535	1	1	[*6·5*]
Kolomea -	Peczenizyn -	Aug. 7	Aug. 7	5,880	2	1	[*1·7*]
	Iwanowce -	„ 14	„ 14	1,568	2	2	*12·8*
	Kolomea -	„ 14	Oct. 30	30,235	112	64	*21·2*
	Werbiazwyzny	„ 15	Aug. 18	974	3	3	*30·7*
	Oskrzesince -	„ 21	Sept. 21	1,236	7	5	*40·5*
	Szcparowce -	„ 22	„ 6	731	14	7	*95·8*
	Gwozdziec -	„ 28	Aug. 28	1,099	1	1	[*9·1*]
	Chomiakowka	„ 31	„ 31	778	1	1	[*12·9*]
	Piadyki -	„ 31	„ 31	1,648	1	1	[*6·1*]
	Kornicz -	Oct. 10	Oct. 13	2,226	3	2	*8·9*
	Siemakowce -	„ 10	„ 16	1,828	3	2	*10·9*
				48,203	149	89	*18·5*
Sniatyn -	Tuloków -	Aug. 10	Aug. 17	1,247	7	5	*40·1*
	Demycze -	„ 19	Sept. 13	2,116	6	5	*23·6*
	Chlebiczyn -	„ 21	Aug. 21	755	1	1	[*13·4*]
	Borszczów -	„ 27	Oct. 30	1,208	2	2	*16·5*
	Sniatyn -	Sept. 19	Sept. 19	10,939	1	1	[*0·9*]
	Zablotów -	„ 20	„ 23	4,054	3	3	*7·1*
				20,319	20	17	*8·4*

Table B.—(1.) Austria—*continued.*

Department.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	Province of Galizien—*cont.*						
Limanowa -	Kasina wielka	Aug. 12	Aug. 20	2,118	3	3	*14·2*
	Mszana dolna	„ 27	„ 27	2,229	2	—	—
	Podobin -	Sept. 13	Sept. 13	851	1	—	—
				5,198	6	3	*5·8*
Brzesko -	Szczepanów -	Aug. 15	Sept. 1	593	8	1	[*16·9*]
	Przyborów -	„ 15	Aug. 15	1,725	2	—	—
	Mokrzyska -	„ 16	„ 16	2,417	1	1	[*4·1*]
	Jasien -	„ 17	„ 17	1,695	1	—	—
	Strzelce wielkie	„ 18	„ 30	1,328	9	5	*37·6*
	Radlowska Wola.	Sept. 10	Sept. 10	1,236	1	—	—
				8,994	22	7	*7·8*
Krakau (city)	Krakau (city)	Aug. 16	Sept. 10	74,593	9	7	*0·9*
Sokal -	Krystynopol -	Aug. 16	Aug. 16	3,625	1	1	[*2·8*]
	Zawisznia -	Oct. 6	Oct. 6	998	1	1	[*10·0*]
				4,623	2	2	*4·3*
Horodenka -	Czerniatyn -	Aug. 19	Sept. 11	2,766	16	12	*43·8*
Kosów -	Chomczyn -	Aug. 21	Aug. 21	2,379	1	1	[*4·2*]
	Jablonica -	Nov. 3	Nov. 3	590	1	1	[*17·0*]
				2,969	2	2	*6·7*
Dolina -	Luhy - -	Aug. 24	Aug. 24	282	3	3	*106·4*
	Dolina -	Sept. 22	Oct. 7	8,357	7	6	*7·2*
				8,639	10	9	*10·4*
Husiatyn -	Oryszkówce	Aug. 24	Aug. 25	1,569	2	1	[*6·4*]
	Kopyczynce -	Sept. 25	Sept. 25	7,259	1	1	[*1·4*]
				8,828	3	2	*2·3*

TABLE B.—(1.) AUSTRIA—*continued.*

Department.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera Attacks.	Total recorded Cholera Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	PROVINCE OF GALIZIEN—*cont.*						
Zydaczów	Mikolajów	Aug. 24	Aug. 24	2,680	1	1	[*3·7*]
	Mlyniska	Sept. 1	Sept. 1	786	1	1	[*12·7*]
	Iwanowce	Sept. 13	Sept. 13	376	1	—	—
	Rogozno	„ 19	„ 19	467	1	—	—
	Krupsko	Oct. 6	Oct. 6	851	1	—	—
	Zydaczów	„ 6	„ 6	2,647	1	1	[*3·8*]
				7,807	6	3	*3·8*
Stanislau	Stanislau	Aug. 24	Oct. 19	22,391	23	15	*6·7*
	Mykietynce	„ 26	„ 27	1,151	8	2	*17·4*
	Podluze	„ 28	Sept. 3	1,185	6	4	*33·7*
	Knihinin Polski.	„ 28	Oct. 26	6,918	31	24	*34·7*
	Chomiaków	„ 31	„ 29	812	6	4	*49·3*
	Opryszowce	Sept. 4	„ 4	1,137	19	14	*123·1*
	Wolczyniec	„ 16	Sept. 26	1,686	7	4	*23·7*
	Zagwózdz	„ 23	Oct. 25	1,653	32	12	*72·6*
	Pasiecezna	Oct. 11	„ 11	1,038	1	1	[*9·6*]
	Uzin	„ 13	„ 28	900	33	16	*177·8*
	Pacyków	„ 13	Nov. 3	1,067	38	19	*178·0*
	Bedmarów	„ 18	Oct. 18	1,406	1	1	[*6·4*]
	Knihinin Colonie.	„ 25	„ 25	1,500	1	—	—
	Hanusowce	„ 27	„ 29	1,450	2	1	[*6·9*]
	Uhorniki	„ 30	Nov. 18	1,214	5	4	*32·9*
	Zabercze	Nov. 28	Dec. 8	572	5	3	*52·5*
				46,080	208	124	*26·9*
Brzozów	Jasienica	Aug. 26	Sept. 16	2,355	23	17	*72·2*
	Golcowa	Sept. 2	„ 3	2,724	3	2	*7·3*
	Jzdebki	„ 21	„ 21	2,665	1	1	[*3·7*]
				7,744	27	20	*25·9*
Saybusch	Stryszawa	Aug. 26	Aug. 26	3,731	1	1	[*2·7*]
Czortków	Jagielnica Stara.	Aug. 27	Aug. 30	1,216	4	4	*32·9*
	Bialy Potok	Sept. 2	Sept. 6	1,076	12	8	*74·3*
				2,292	16	12	*52·4*
Sanok	Wislok Wielki	Aug. 27	Sept. 3	2,162	8	3	*13·9*
	Rymanów	„ 31	Dec. 16	3,704	130	58	*156·6*
	Krolik Polski	Sept. 8	Sept. 8	715	1	—	—
	Polany Surowiczne.	„ 11	„ 11	645	1	—	—

TABLE B.—(1.) AUSTRIA—*continued.*

Department.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera Attacks.	Total recorded Cholera Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	PROVINCE OF GALIZIEN—*cont.*						
Sanok—*cont.*	Wroblik Szlachecki.	Sept. 11	Sept. 22	645	4	3	*46·5*
	Posada Dolna	„ 15	Oct. 27	923	9	4	*43·3*
	Ladzin	„ 16	Dec. 1	521	6	4	*76·8*
	Posada Górna	„ 19	Oct. 3	1,412	4	1	[*7·1*]
	Niebieszczany	„ 19	Sept. 19	1,604	2	—	—
	Wielopole	„ 22	„ 22	481	1	—	—
	Zagórz	„ 24	„ 24	2,111	1	—	—
	Zablotce	„ 29	„ 30	231	2	2	*99·5*
	Pielnia	Oct. 3	Oct. 19	1,029	2	2	*19·4*
	Bukowsko Markt.	„ 10	„ 25	1,006	21	9	*89·5*
	Darów	„ 12	„ 12	324	1	1	[*30·9*]
	Nowosielce	„ 13	„ 29	1,299	3	2	*15·4*
	Dlugie	„ 20	„ 20	1,326	1	1	[*7·5*]
	Siemuszowa	„ 21	„ 21	799	1	1	[*12·5*]
	Posada Zarszynska.	Nov. 4	Nov. 7	698	2	2	*28·7*
	Jedruszkowice	„ 5	„ 13	231	9	4	*173·2*
	Zarszyn	„ 8	„ 8	1,050	1	1	[*9·5*]
	Besko	„ 11	„ 11	2,491	1	—	—
				25,877	206	98	*38·6*
Bohorodczany	Lachowce	Aug. 29	Sept. 26	2,179	2	2	*9·1*
	Bohorodczany	Sept. 4	Nov. 2	4,819	43	28	*47·4*
	Lysiec	„ 18	Oct. 18	2,581	9	5	*19·4*
	Horocholina	Oct. 29	Nov. 24	2,906	17	6	*20·6*
	Zuraki	Nov. 13	„ 14	1,663	4	3	*18·0*
				14,148	75	39	*27·6*
Nisko	Nisko	Sept. 1	Sept. 1	3,837	1	1	[*2·6*]
Rohatyn	Poswierz	Sept. 2	Sept. 2	262	3	3	*114·5*
Kamionka strumilowa	Nahorce Male	Sept. 2	Sept. 2	972	1	—	—
	Tetewczyce	„ 13	„ 13	859	1	—	—
				1,831	2	—	—
Stryi	Oporzec	Sept. 11	Sept. 20	901	5	4	*44·4*
	Skole	Oct. 9	Oct. 9	3,386	1	1	[*3·0*]
	Hrebenów	„ 9	„ 12	332	6	4	*120 5*
	Tuchla	„ 16	„ 16	1,133	1	—	—
	Lowoczne	Nov. 11	Nov. 11	851	1	1	[*11·7*]
	Tarnawka	„ 11	„ 27	658	6	3	*45·6*
				7,261	20	13	*17·9*

TABLE B.—(1.) AUSTRIA—*continued.*

Department.	Town or Village.	Date of		Popula-tion.	Total recorded Cholera		Cholera Death-rate per 10,000 Popula-tion, 1893.
		First recorded Case of Cholera, 1893.	Last recorded Case of Cholera, 1893.		Attacks.	Deaths.	
	PROVINCE OF GALIZIEN—*cont.*						
Tlumacz -	Ottynia -	Sept. 11	Sept. 15	4,207	7	4	*9·5*
	Podpieczary -	„ 23	„ 23	1,948	1	—	—
				6,155	8	4	*6·5*
Przemysl -	Klokowice -	Sept. 12	Sept. 12	231	1	—	—
Wieliczka -	Lipnik -	Sept. 12	Sept. 12	1,192	1	1	*[8·4]*
Zaleszczyki	Capowce -	Sept. 15	Sept. 15	1,658	2	2	*12·1*
	Zaleszczyki -	Oct. 28	Oct. 28	5,751	1	1	*[1·7]*
				7,409	3	3	*4·0*
Krakau	Wolica -	Sept. 18	Sept. 20	389	2	2	*51·4*
	Dabie -	„ 21	„ 28	737	4	3	*40·7*
				1,126	6	5	*44·4*
Kalusz -	Humenow -	Sept. 24	Oct. 17	380	25	10	*263·2*
	Babin -	Oct. 12	„ 12	1,260	1	—	—
	Kałusz -	„ 19	Nov. 12	7,526	3	3	*3·9*
	Seredne -	„ 27	„ 5	620	15	8	*129·0*
	Podhorki -	„ 28	Oct. 28	1,248	1	1	*[8·0]*
	Rania -	Nov. 2	Nov. 17	704	6	1	*[14·2]*
				11,738	51	23	*19·6*
Lancut -	Kraeczowice -	Oct. 11	Oct. 11	1,038	1	—	—
Stare Miasto.	Stare Miasto -	Oct. 11	Oct. 11	3,958	1	1	*[2·5]*
	Chyrów -	Nov. 1	Dec. 6	2,574	38	22	*85·5*
	Chyrowska Posada.	„ 9	Nov. 20	649	5	3	*46·2*
	Wolcza Dolna	„ 9	„ 9	717	1	1	*[13·9]*
	Slohynie -	„ 10	„ 10	485	1	1	*[20·6]*
	Berezów -	„ 11	„ 20	502	6	2	*39·8*
	Stara Ropa -	„ 17	„ 20	2,863	2	1	*[3·5]*
	Grodowice -	Dec. 12	Dec. 14	818	4	2	*24·4*
				12,566	58	33	*26·3*

TABLE B.—(1.) AUSTRIA—*continued.*

Department.	Town or Village.	Date of		Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population 1893.
		First recorded Case of Cholera, 1893.	Last recorded Case of Cholera, 1893.		Attacks.	Deaths.	
	PROVINCE OF GALIZIEN—*cont.*						
Lisko	Ustrzyki Górne.	Oct. 15	Nov. 15	353	12	6	*170·0*
	Berchy Dolne	Nov. 4	„ 6	773	3	2	*25·9*
	Lutowiska -	„ 18	Dec. 31	2,185	6	5	*22·8*
				3,311	21	13	*39·3*
Buczacz	Scianka -	Oct. 24	Oct. 24	1,614	1	1	[*6·2*]
	Koropiec -	Nov. 18	Nov 18	4,870	1	1	[*2·0*]
				6,484	2	2	*3·1*
Dobromil	Kroscienko -	Oct. 24	Oct. 24	1,274	1	—	—
	Smolnica -	„ 25	„ 31	304	2	2	*65·8*
	Dobromil -	Nov. 13	Nov. 13	3,237	1	1	[*3·1*]
				4,813	4	3	*6·2*
Brody -	Zalozce -	Oct. 31	Dec. 2	7,295	14	5	*6·9*
Sambor -	Brzesciany -	Nov. 27	Nov. 27	754	1	1	[*13·3*]
Tarnopol -	Plotycz -	Dec. 6	Dec. 17	1,068	8	4	*37·5*
	PROVINCE OF STEIERMARK.						
Cilli -	St. Georgia -	Aug. 8	Aug. 8	4,269	1	1	[*2·3*]
	PROVINCE OF BUKOWINA.						
Czernowitz (city).	Czernowitz (city).	Aug. 16	Aug. 30	54,171	3	2	*0·4*
Sereth -	Kliboka -	Aug. 25	Aug. 25	3,947	1	—	—
Czernowitz (dist.)	Bojan -	Aug. 26	Aug. 26	6,242	1	1	[*1·6*]
Kotzman -	Dorosszoutz	Sept. 14	Sept. 21	2,574	3	2	7·8
		Oct. 29	Nov. 17	2,273	12	8	*35·2*
				4,847	15	10	*20·6*
	PROVINCE OF NIEDER ÖSTERREICH.						
Wien (city)	Wien (city) -	Aug. 22	Nov. 22	1,364,548	4	3	*0·02*

Table B.—(2.) Hungary.

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
	SZATMÁR-NÉMETI -	June 24	20,736	102	54	[26·0]
Szolnok-Doboka -	Vicze - -	„ 29	883	3	3	34·0
	Falkusa - -	July 3	293	14	6	204·8
	Deés - -	„ 4	7,728	30	28	36·2
	Kötelesmező(tanya)	„ 6	534	2	2	37·5
	Karjon - -	„ 7	489	2	2	40·9
	Szász-Nyires -	„ 8	1,200	34	20	166·8
	Magyar-Décse -	„ 12	1,385	1	—	7
	Alsó-Hagymás -	„ 16	768	13	11	143·2
	Alsó-Kosály -	„ 20	1,171	2	2	17·1
	Kodor - - -	„ 20	414	11	8	193·4
	Kis-Kaján -	„ 22	786	53	28	356·5
	Nagy-Kaján - -	„ 28	592	19	12	202·8
	Hollómező -	„ 29	1,015	6	5	49·2
	Aranyos - Szent - Miklós.	Aug. 3	369	12	5	135·5
	Csicsó-Keresztúr -	„ 4	717	9	4	55·8
	Szelecske - -	„ 5	524	12	9	171·8
	Alsó-Ilosva -	„ 6	609	7	6	98·5
	Lábfalva - -	„ 6	481	3	3	62·4
	Szamos-Ujvár -	„ 6	5,793	16	14	24·2
	Semesnye - -	„ 8	1,408	35	23	163·2
	Kis-Iklod - -	„ 9	400	4	4	100·0
	Al-Ör - -	„ 10	640	2	2	31·2
	Dögmező - -	„ 11	911	1	1	[11·1]
	Nagy-Iklód -	„ 12	1,172	6	3	25·6
	Sajó-Udvarhely -	„ 13	778	3	3	38·5
	Tökepataka -	„ 16	435	8	3	69·0
	Dobrovicsina -	„ 19	367	1	1	[27·2]
	Rév-Kolostor -	„ 22	585	10	5	85·5
	Ilondapataka -	„ 23	237	4	3	126·6
	Szent-Benedek -	„ 23	423	1	1	[23·6]
	Oroszmező - -	„ 24	1,048	7	1	[9·5]
	Betlen - -	„ 26	2,272	1	1	[4·4]
	Dengeleg - -	„ 26	636	1	1	[15·7]
	Alsó-Oroszfalu -	„ 27	342	2	1	[29·2]
	Fodorháza - -	„ 27	643	2	1	[15·5]
	Alsó-Csobánka -	„ 28	455	1	1	[22·0]
	Karulyfalva -	„ 28	516	4	1	[19·4]
	Kozárvár - -	„ 28	1,378	11	6	45·7
	Csente - -	„ 31	378	1	1	[26·5]
	Hesdát - -	„ 31	273	1	—	—
	Nagy-Ilonda -	„ 31	857	1	—	—
	Kaczkó - -	Sept. 2	1,364	1	1	[7·3]
	Omlásalja - -	„ 3	487	8	7	143·8
	Buza - -	„ 4	1,658	2	2	12·1
	Bába - - -	„ 5	610	1	1	[16·4]
	Kendi-Lona -	„ 5	1,125	1	1	[8·9]
	Szent-Margita -	„ 15	1,314	2	—	—
			48,463	376	248	50·2

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Bereg	Tisza-Kerecseny	June 30	1,241	25	15	*120·9*
	Hetyen	July 4	591	17	9	*152·4*
	Kis-Bégány	„ 6	767	9	9	*117·4*
	Mezö-Kászony	„ 7	1,726	2	—	—
	Vásáros-Namény	„ 13	1,501	34	20	*133·0*
	Barabás	„ 14	1,164	4	2	*17·2*
	Tisza-Szalka	„ 20	1,213	23	13	*107·4*
	Vámos-Atya	„ 20	955	2	—	—
	Tisza-Adony	„ 26	854	15	10	*117·0*
	Mezö-Vári	„ 29	2,340	7	6	*25·6*
	Hátmeg	Aug. 1	1,421	17	14	*98·5*
	Jánd	„ 1	860	9	4	*46·5*
	Kis-Lónya	„ 5	571	7	3	*52·5*
	Tarpa	„ 5	3,040	10	4	*13·4*
	Badaló	„ 6	929	17	8	*86·1*
	Ugornya	„ 8	494	9	3	*60·7*
	Kovászó	„ 10	528	9	6	*113·6*
	Gergelyi	„ 11	787	7	1	*[12·7]*
	Tisza-Vid	„ 12	556	1	—	—
	Nagy-Lónya	„ 14	1,341	24	11	*82·1*
	Beregszász	„ 15	8,078	4	3	*3·7*
	Nagy-Muzsaly	„ 15	1,113	1	1	*[9·0]*
	Csaroda	„ 17	879	1	1	*[11·4]*
	Maszárfalva	„ 21	829	2	1	*[12·1]*
	Miszticze	„ 24	1,448	13	6	*[41·4]*
	Tivadar	„ 24	284	5	3	*105·7*
	Iloncza	„ 27	3,100	1	1	*[3·2]*
	Szolyva - Nagy Bisztra.	„ 27	1,836	11	7	*38·1*
	Bene	„ 29	539	4	2	*45·5*
	Felsö-Remete	Sept. 3	273	4	3	*109·9*
	Munkács	„ 4	10,531	17	14	*13·3*
	Gecse	„ 7	297	2	1	*[33·7]*
	Dombostelek	„ 9	449	1	1	*[22·3]*
	Macsola	„ 28	368	1	1	*[27·2]*
	Alsó-Remete	„ 25	374	3	2	*53·5*
	Gát	Oct. 21	1,031	1	1	*[9·7]*
	Surány	„ 25	727	1	1	*[13·8]*
			54,038	320	187	*34·6*
Szatmár	Csenger-Bagos	July 4	1,414	5	4	*28·3*
	Szamosbecs	„ 4	2,213	40	23	*104·0*
	Kocsord	„ 5	1,767	5	4	*22·6*
	Csenger	„ 9	3,111	4	3	*9·6*
	Panyola	„ 9	1,387	19	10	*72·1*
	Angyalos	„ 16	620	4	2	*32·3*
	Czégény-Dányád	„ 16	430	7	5	*116·2*
	Jánk	„ 17	1,007	1	1	*[10·0]*
	Erdöszáda	„ 18	1,288	19	13	*101·0*
	Kölcse	„ 19	1,259	6	3	*23·8*
	Erdöd	„ 20	2,671	2	2	*7·5*
	Fülpös-Darócz	„ 20	301	2	1	*[33·2]*
	Penyige	„ 20	678	1	—	—

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera Attacks.	Total recorded Cholera Deaths.	Cholera Death-rate per 10,000 Population, 1893.
Szatmár—*cont.*	Szaniszló - -	July 20	4,352	1	1	[2·3]
	Cségény - -	„ 22	397	5	4	101·0
	Kis-Ár - -	„ 22	905	13	6	66·3
	Puszta-Daroócz -	„ 22	437	5	3	68·6
	Dobrács-Apáti -	„ 25	341	4	4	117·4
	Szamos-Ujlak -	„ 25	291	26	12	412·5
	Tunyog - -	„ 25	997	3	2	20·1
	Óvári - -	„ 27	1,321	2	2	15·1
	Bápolt -	„ 27	338	4	3	88·7
	Sályi - -	„ 27	757	4	4	52·9
	Tökés - - -	„ 27	879	1	1	[11·4]
	Kér - -	„ 29	838	21	12	143·2
	Parasznya - -	„ 29	634	1	1	[15·8]
	Csekke - -	„ 30	1,824	21	14	76·8
	Felső-Fernezely -	„ 30	1,046	9	4	38·3
	Sima - - -	„ 30	459	20	8	174·4
	Olcsva - -	Aug. 1	768	17	9	117·2
	Ó-Pályi - -	„ 1	1,683	9	5	29·7
	Györtelek - -	„ 2	820	4	3	36·6
	Piskárkos - -	„ 2	874	2	2	22·9
	Apa - -	„ 4	2,689	9	7	26·0
	Csolt - - -	„ 4	472	3	1	[21·2]
	Szamosszeg -	„ 4	2,213	40	23	104·0
	Fehér-Gyarmat -	„ 6	3,612	11	4	11·1
	Nagy-Ecsed -	„ 6	3,133	13	9	28·7
	Csécse - -	„ 8	291	1	1	[34·4]
	Darnó - -	„ 8	209	1	1	[47·9]
	Milota - -	„ 8	796	4	2	25·1
	Pátyod - -	„ 8	583	5	5	85·7
	Tisza-Kóród -	„ 9	1,029	7	4	38·9
	Gyügye - -	„ 10	361	1	1	[27·7]
	Lukácsfalu - -	„ 10	334	1	1	[30·0]
	Nagy-Ár - -	„ 10	828	2	1	[12·1]
	Tományа - -	„ 10	714	9	7	98·0
	Hermánszeg -	„ 11	350	2	1	[27·6]
	Kér-Semjén -	„ 12	505	4	2	39·6
	Tiszsa-Berek -	„ 12	634	12	8	126·2
	Avas-Ujfalu -	„ 13	1,328	2	2	15·1
	Alsó-Fernezely -	„ 14	1,626	27	9	55·4
	Kak-Szent-Márton	„ 14	513	3	1	[19·5]
	Barlafalu - -	„ 18	1,498	2	2	13·3
	Lénárdfalu - -	„ 18	759	2	2	26·3
	Oláh-Tótfalu -	„ 20	632	18	10	158·2
	Bikszád - -	„ 21	1,487	2	1	[6·7]
	Máté-Szaka -	„ 22	4,589	1	1	[2·2]
	Hosszúfalu -	„ 23	685	1	1	[14·6]
	Nagybánya - -	„ 23	9,838	32	16	16·2
	Bujánháza -	„ 25	735	20	15	204·0
	Terep - - -	„ 25	688	5	2	29·1]
	Szinyér-Váralja -	„ 26	4,008	2	—	—
	Vámfalu - -	„ 27	1,712	5	4	23·4
	Felső-Sándorfalu -	„ 28	424	2	1	[23·6]
	Kányaháza - -	„ 31	1,722	2	2	11·6
	Mózesfalu - -	Sept. 5	564	2	—	—
	Sárköz -	„ 14	2,001	4	3	15·0
			89,795	504	301	33·6

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Nyitra	Molnos	July 7	548	2	1	[*18·2*]
	Nagy-Tapolcsány	Sept. 27	4,244	1	1	[*2·4*]
	Podluzsány (puszta).	Oct. 9	70	2	2	—
	Érsekujvár	„ 12	11,299	12	8	*7·1*
	Negyed	„ 20	3,848	1	1	[*26·0*]
	Chrábor	„ 24	553	4	4	*72·2*
	Nagy-Surány	„ 25	4,613	12	4	*8·7*
	Sempte	„ 26	1,748	3	1	[*5·7*]
	Sopornya	„ 28	2,989	2	1	[*3·3*]
	Bánkeszi	Nov. 2	1,490	2	1	[*6·7*]
			31,402	41	24	*7·6*
Hajdu	Csege	July 7	3,739	17	7	*18·7*
Ugocsa	Sós-Újfalu	July 12	526	3	3	*57·0*
	Halmi	„ 17	2,051	1	1	[*4·9*]
	Királyháza-Tölgyeso falva.	„ 18	1,707	2	1	[*5·9*]
	Nagy-Gércze	„ 22	874	1	1	[*11·4*]
	Nagy-Szöllös	„ 22	5,187	2	1	[*1·9*]
	Szászfalu	„ 29	1,522	9	6	*39·4*
	Veléte	Aug. 2	2,131	2	2	*9·4*
	Gödényháza	„ 4	715	45	17	*238·0*
	Kis-Kupány	„ 5	696	1	1	[*14·4*]
	Kis-Tarna	„ 6	674	4	1	[*14·8*]
	Verécze	„ 6	872	3	2	*22·9*
	Bökény	„ 8	843	15	9	*106·8*
	Nagy-Tarna	„ 12	1,453	36	16	*110·0*
	Száraszpatak	„ 14	696	7	5	*71·8*
	Alsó-Karaszló	„ 21	1,797	1	1	[*5·6*]
	Akli	„ 21	284	5	3	*105·5*
	Tisza-Újlak	„ 21	2,845	3	2	*7·0*
	Csoma	„ 22	235	11	7	*298·0*
	Csarnató	„ 25	606	1	—	—
	Forgolány	„ 28	741	3	3	*40·5*
	Hetény	Sept. 2	442	1	1	[*22·6*]
			26,897	156	83	*30·9*
Zemplén	Töke-Lucz	July 15	2,257	49	20	*88·6*
	Tokaj	„ 17	4,815	4	4	*8·3*
	Nagy-Tárkány	„ 28	1,007	31	15	*149·0*
	Kis-Czigánd	„ 29	1,743	80	28	*160·5*
	Nagy-Czigánd	„ 29	1,440	90	29	*201·4*
	S.-A.-Ujhely	„ 30	13,017	3	2	*1·5*
	Ricse	Aug. 2	1,490	5	3	*20·1*
	Karád	„ 5	2,169	69	10	*46·1*
	Karcsa	„ 22	1,313	1	—	—
	Nagy-Mihály	Sept. 11	4,502	29	17	*37·7*
	Málcza	„ 23	918	4	3	*32·6*
	B.-Szerdahely	„ 30	1,106	8	5	*45·2*
	Nátafalva	Oct. 15	1,023	1	1	[*9·8*]
	Sáros-Patak	„ 15	6,350	1	1	[*1·6*]

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Zemplén—*cont.*	K. Helmecz	Oct. 16	2,106	6	4	*19·0*
	Töke-Terebes	„ 16	4,189	2	2	*4·8*
	Lasztomér	„ 19	1,353	3	2	*14·8*
	Oreszka	„ 29	445	2	1	[*22·5*]
			51,248	388	147	*28·7*
Kolozs	Apahida	July 20	1,189	2	2	*16·9*
	Bonczhida	„ 29	1,942	25	15	*77·3*
	Válaszút	Aug. 1	1,316	5	3	*22·8*
	Kajántó	„ 8	1,062	1	1	[*9·4*]
	Mező-Domb	„ 13	863	1	1	[*11·6*]
	Szamosfalva	„ 16	1,329	5	4	*30·1*
	Nemes-Zsuk	„ 17	655	5	3	*45·8*
	Kolozs-Monostor	„ 20	3,099	11	9	*29·1*
	Fejérd	„ 21	2,134	3	2	*9·4*
	Mócs	„ 22	1,737	1	1	[*5·8*]
	Viszolya	„ 23	686	1	1	*14·6*
	Felek	„ 24	1,719	5	5	*29·0*
	Méra	„ 25	1,220	1	—	—
	Csucsa	„ 26	1,605	1	1	[*6·2*]
	Felső-Zsuk	„ 26	541	3	3	*55·5*
	Bács	„ 28	1,126	1	1	[*8·9*]
	Nagy-Petri	„ 28	618	3	3	*48·5*
	Alsó-Zsuk	Sept. 1	567	1	1	[*17·6*]
	Tóttelke	„ 2	430	1	1	[*23·2*]
	Gyalu	„ 3	2,857	1	1	[*3·5*]
	Szász-Fenes	„ 3	2,255	3	2	*8·9*
	Gyulatelke	Oct. 26	510	1	1	[*19·6*]
			29,460	81	61	*20·7*
	Kolozsvár	July 21	35,930	209	128	*35·6*
	Budapest	July 22	491,938	183	109	*2·2*
Mármaros	Kis Lonka és Kuzi	July 24	1,945	105	34	*174·8*
	Körösmező	„ 25	7,620	175	84	*110·0*
	Mármaros-Sziget	„ 27	14,758	47	30	*20·3*
	Dulfalva	„ 29	1,079	46	26	*241·0*
	Borkút	„ 31	832	52	28	*336·5*
	Rahó	„ 31	5,767	243	102	*176·9*
	Trebusa-Fejérpatak	Aug. 1	1,881	167	64	*340·0*
	Nagy-Bocskó	„ 2	4,538	177	61	*134·4*
	Kaszó-Polyána	„ 4	1,588	4	4	*25·2*
	Nagy-Kirva	„ 4	802	1	1	[*12·5*]
	Visk	„ 5	4,054	19	14	*34·5*
	Kabolapolyána	„ 6	1,406	3	2	*14·2*
	Széles-Lonka	„ 6	975	2	1	[*10·2*]
	Talaborfalva	„ 7	2,099	31	21	*100·0*
	Taraczköz	„ 7	1,070	5	3	*28·0*
	Fejéregyháza	„ 9	1,305	11	8	*61·4*
	Ferenczvölgy	„ 9	299	14	8	*267·5*

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Mármaros —*cont.*	Száldobos - -	Aug. 9	1,065	5	3	*28·2*
	Técsö - -	„ 9	3,733	16	11	*29·4*
	Vajnág - -	„ 9	836	19	8	*90·3*
	Csománfalu -	„ 10	1,299	1	1	[*7·7*]
	Huszt - - -	„ 12	7,461	5	3	*4·0*
	Szeklencze -	„ 12	1,894	5	3	*15·8*
	Ökörmezö - -	„ 15	2,321	1	1	[*4·3*]
	Bogdán - -	„ 17	2,596	10	7	*26·9*
	Falu-Bustyaháza -	„ 17	1,619	2	2	*12·3*
	Karácsonfalu -	„ 20	1,815	3	—	—
	Rónaszék - -	„ 22	1,552	2	2	*12·9*
	Sajó-Polyána -	„ 22	941	76	44	*467·5*
	Akna-Szlatina -	„ 24	2,052	5	4	*19·5*
	Közép-Apsa -	„ 24	2,700	38	17	*62·9*
	Petrova - -	„ 24	3,061	1	1	[*3·3*]
	Borsa - -	„ 27	6,219	8	7	*11·2*
	Felsö-Visső - -	„ 27	6,385	10	8	*12·5*
	Batiza - -	„ 30	1,230	24	9	*73·1*
	Sajó - - -	„ 30	1,231	6	6	*48·7*
	Berezna - -	Sept. 1	1,782	2	2	*11·5*
	Irholcz - -	„ 1	2,766	10	7	*25·3*
	Glód - -	„ 3	843	1	1	[*11·9*]
	Kalocsa-Imsád -	„ 4	697	1	1	[*14·3*]
	Rozályva - -	„ 6	1,827	1	1	[*5·5*]
	Barczánfalva -	„ 10	2,633	2	2	*7·6*
	Szacsal - -	„ 13	2,209	16	7	*31·7*
	Ruszkova -	„ 20	2,008	2	2	*10·0*
	Német-Mokra -	„ 25	702	1	—	—
	Felsö-Apsa -	„ 29	2,242	1	1	[*4·5*]
	Majdánka - -	„ 30	2,143	4	2	*9·3*
	Gánya - -	Oct. 1	1,799	16	12	*66·7*
	Pilipecz - -	„ 1	605	53	11	*182·0*
	Alsó-Hidegpatak -	„ 2	976	6	3	*30·7*
	Iszka - - -	„ 4	695	8	3	*43·1*
	Falu-Szlatina -	„ 7	2,825	3	2	*7·1*
	Dombó - -	„ 8	2,630	2	2	*7·6*
	Mojszén - -	„ 8	2,903	34	20	*69·0*
	Alsó-Apsa - -	„ 10	3,998	6	5	*12·5*
	Konyha - -	„ 21	1,584	9	8	*52·1*
	Kis-Kirva - -	„ 22	555	2	2	*36·0*
	Kelecsén - -	Nov. 5	616	1	1	[*16·2*]
	Alsó-Visső - -	„ 8	3,036	1	1	[*3·3*]
	Jód - -	„ 18	2,307	4	4	*17·3*
			146,349	1,528	728	*49·7*
Ung -	Salamon - -	July 27	807	14	9	*111·5*
	Csap - - -	„ 28	1,629	8	1	[*6·1*]
	Gerény - -	Aug. 3	698	1	—	—
	Nyeviczke - -	„ 14	728	1	1	[*14·0*]
	Ásvány - -	„ 16	316	3	2	*63·2*
	Dubrinics - -	„ 22	1,200	1	1	[*8·3*]
	Ptrutsa -	„ 23	726	2	2	*27·5*
	Ungvár - -	„ 36	11,793	49	37	*31·4*

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Ung—*cont.*	Györöcske	Aug. 27	177	1	—	—
	Záhony	Sept. 1	1,174	7	3	*25·6*
	Putka-Helmecz	„ 7	765	1	1	*[13·1]*
	Bécs	„ 12	839	1	1	*[11·9]*
	Lakárt	„ 26	1,293	6	4	*30·9*
	Téglás	„ 27	417	1	1	*[24·0]*
	Darma	Oct. 1	664	1	—	—
	Sztrajnyán	„ 10	1,497	15	11	*73·5*
	Pálócz	„ 11	1,920	5	2	*10·4*
	Nagy-Kapos	„ 16	1,174	3	2	*17·0*
	Szenna	Nov. 2	688	3	2	*29·1*
	Viszoka (tanya)	„ 20	1,187	6	5	*42·1*
			29,687	124	85	*28·6*
Szilágy	Sülelmed	July 29	734	7	5	*68·1*
Bihar	Kis-Rábé puszta	July 31	2,435	9	5	*20·5*
	Nagy-Rábé	Aug. 20		4	—	
	Ér-Mihályfalva	„ 21	4,856	4	3	*6·2*
			7,291	17	8	*11·0*
Borsod	Nyék	July 31	565	1	1	*[17·7]*
	Szomolya	„ 31	1,531	2	1	*[6·5]*
	Tisza-Tarján	Aug. 13	1,437	13	7	*48·7*
	Tisza-Palkonya	„ 17	1,575	5	3	*19·1*
	Kis-Tokaj	„ 26	648	1	1	*[15·4]*
	Mályi	„ 30	562	1	1	*[17·8]*
	Dorogma	„ 31	1,205	3	1	*[8·3]*
	Mező-Csát	Sept. 1	5,215	1	1	*[1·9]*
	Szederkény	„ 1	1,578	1	1	*[6·3]*
			14,316	28	17	*11·9*
Tolna	Dunaföldvár	July 31	12,364	1	—	—
	Dombovár	Aug. 23	3,967	1	—	—
	Nagy-Székely	Sept. 7	2,517	1	—	—
	Paks	Oct. 11	11,803	1	—	—
	Lajvér puszta	Nov. 3	8,153	1	1	*2·5*
	Báttaszék	„ 7		2	1	
	Köveed-Puszta	„ 21		1	—	
	Tolna	Dec. 5	7,954	1	1	*[1·3]*
			46,758	9	3	*0·6*
Jász-Nagy-Kún-Szolnok.	Szolnok	Aug. 1	20,748	197	127	*61.3*
	Tisza-Bura	„ 7	2,409	28	9	*37·3*
	Tisza-Püspöki	„ 7	1,885	11	7	*37·1*
	Karczag	„ 8	18,197	1	1	*[0·5]*
	Kötelek	„ 8	2 378	43	28	*117·8*

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Jász-Nagy-Kún-Szolnok—*cont.*	Nagy-Körü -	Aug. 8	2,636	25	14	*53·1*
	Tisza-Abád -	„ 8	2,738	7	6	*21·9*
	Tisza-Beö - -	„ 8	1,992	12	2	*10·0*
	Tisza-Roff (Antolhát).	„ 8	4,956	22	9	*18·1*
	Tisza-Szajol -	„ 8	1,241	66	31	*250·0*
	Kunhegyes - -	„ 9	8,465	1	1	[*1·2*]
	Tisza-Verseny -	„ 9	2,682	7	6	*22·4*
	Tisza-Ug - -	„ 10	919	11	11	*119·6*
	Tisza-Szent-Imre -	„ 11	3,122	2	—	—
	Tisza-Süly - -	„ 14	2,722	10	7	*25·7*
	Tisza-Szalók -	„ 14	3,520	29	13	*34·0*
	Tisza-Várkony -	„ 18	2,312	7	3	*13·0*
	Bessenyszög -	„ 21	3,953	1	1	[*2·5*]
	Tisza-Nagy-Rev -	„ 21	1,548	2	1	[*6·5*]
	Mezö-Tur - -	„ 23	23,757	1	—	—
	Tisza-Kürt -	„ 24	2,915	15	11	*37·7*
	Czibakháza - -	„ 25	4,428	1	—	—
	Jászberény -	„ 26	24,331	2	2	*0·8*
	Rákóczi - -	„ 26	1,927	5	2	*10·4*
	Tisza-Földvár -	„ 26	7,752	2	2	*2·6*
	Tisza-Sas - -	„ 30	1,679	1	1	[*6·0*]
	Madaras - -	„ 31	7,678	1	—	—
	Kisujszállás -	Sept. 6	12,527	2	1	[*0·8*]
	Török - Szent - Miklós.	„ 6	18,772	11	11	*5·9*
	Jász-Apáti - -	Nov. 25	10,401	2	2	*1·9*
			204,880	525	309	*15·1*
Szábolcs -	Eszeny - -	Aug. 1	1,626	56	18	*110·8*
	Szalóka - -	„ 1	767	30	9	*117·3*
	Veresmart -	„ 1	1,260	14	10	*79·4*
	Tisza-Dada -	„ 3	2,473	4	1	[*4·0*]
	Rakamaz - -	„ 4	3,473	12	7	*20·1*
	Tisza - Szent-Márton.	„ 5	866	4	2	*23·1*
	Tuzsér - -	„ 5	1,120	25	10	*89·3*
	Zsurk - -	„ 5	896	72	17	*189·8*
	Dombrád - -	„ 7	3,913	83	40	*102·4*
	Kis-Várda - -	„ 7	6,458	32	22	*34·0*
	Vencsellö - -	„ 7	2,565	1	1	[*3·9*]
	Benk - - -	„ 8	447	12	8	*179·0*
	Bezdéd - -	„ 8	1,371	1	—	—
	Ör-Ladány - -	„ 8	450	18	6	*133·2*
	Pátroha - -	„ 8	2,149	1	1	[*4·7*]
	Berczel - -	„ 9	1,850	10	6	*32·4*
	Tisza-Dob -	„ 10	3,160	8	5	*15·8*
	Érháti tanya -	„ 11	242	5	3	*124·0*
	Nyir-Bátor - -	„ 12	5,061	2	1	[*2·0*]
	Timár - -	„ 12	1,167	9	6	*51·4*
	Balsa - - -	„ 13	1,343	3	1	[*7·4*]
	Eperjeske	„ 13	845	2	1	[*11·8*]
	Kétérközti tanya -	„ 13	148	10	5	*338·0*

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Szabolcs—*cont.*	Tisza-Lök	Aug. 13	3,954	4	2	*5·1*
	Karász	„ 14	2,028	42	19	*93·7*
	Gáva	„ 15	2,534	2	1	*[3·9]*
	Ibrony	„ 15	843	26	12	*142·2*
	Tisza-Ladány	„ 16	1,142	1	1	*[8·8]*
	Ajak	„ 19	1,006	2	2	*19·9*
	Csobaj	„ 19	862	1	1	*[11·6]*
	Nagyfalu	„ 19	1,441	1	—	—
	Szabolcs	„ 19	634	1	1	*[15·8]*
	Uj-Fehértó	„ 20	7,898	1	1	*[1·3]*
	Mogyoros	„ 28	704	14	8	*113·6*
	Nyiregyháza	Sept. 10	27,014	1	1	*[0·4]*
	Fényes-Litke	„ 15	1,948	2	2	*10·3*
	Mándok	„ 26	2,534	2	1	*[3·9]*
			98,187	514	232	*23·6*
Csongrád	Mindszent	Aug. 2	12,033	87	62	*51·5*
	Algyő	„ 11	2,566	10	4	*15·6*
	Csongrád	„ 11	20,802	57	40	*19·2*
	Tápé	„ 13	2,884	15	10	*34·7*
	Csány	„ 19	2,978	1	—	—
	Dorozsma	„ 19	12,325	2	2	*1·6*
	Szegvár	„ 27	6,810	2	1	*[1·5]*
	Sándorfalva	Sept. 20	3,780	6	5	*13·2*
	Horgos	Oct. 6	5,508	2	2	*3·6*
	Szentes	„ 18	30,791	1	1	*[0·3]*
			100,492	183	127	*12·7*
Zólyom	Kis-Garam	Aug. 2	1,904	1	1	*[5·3]*
	Beszterczebánya.	„ 31	7,485	1	—	—
			9,389	2	1	*[1·1]*
Heves	Tisza-Füred	Aug. 8	8,024	11	10	*12·5*
	Sarud	„ 8	2,804	81	23	*82·3*
	Tisza-Nána	„ 8	4,356	40	14	*32·2*
	Poroszló	„ 15	5,012	5	5	*10·0*
	Tarna-Méra	„ 21	1,517	1	1	*[6·6]*
	Pély	„ 22	2,604	1	1	*[3·8]*
	Kis-Köre	„ 23	2,570	14	7	*27·3*
	Tisza-Örvény	„ 26	651	2	1	*[15·4]*
	Nagy-Iván	„ 28	2,090	2	—	—
	Domoszló	Sept. 26	1,985	1	1	*[5·0]*
			31,613	158	63	*19·9*

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Pest-Pilis-Solt-Kis-Kún.	Gyömrö	Aug. 3	1,538	1	1	[6·5]
	Kún-Szent-Miklós	„ 4	8,239	4	3	3·6
	Kalocsa	„ 9	18,176	2	—	—
	Majsa	„ 13	12,221	1	1	[0·8]
	Kis-Kún-Félegyháza.	„ 16	30,326	1	1	[0·3]
	Fülöpszállás	„ 20	4,861	2	—	—
	Sziget-Szent-Miklós	„ 23	2,738	6	6	21·9
	Tószeg	„ 23	3,312	5	2	6·0
	Albertfalva	„ 24	592	3	3	50·7
	Czegléd	„ 24	27,549	2	2	0·7
	Abony	„ 25	12,012	2	1	[0·8]
	Páty	„ 26	2,375	2	2	8·4
	Nagy-Tétény	„ 27	2,346	3	1	[4·3]
	Pilis	„ 27	4,219	1	1	[2·4]
	Kis-Körös	„ 29	7,878	1	—	—
	Ö-Kécske	„ 29	2,985	1	1	[3·3]
	Tápió-Szele	„ 29	5,571	6	3	5·4
	Kis-Harta	Sept. 5	4,402	3	1	[2·3]
	Kis-Kún-Laczháza	„ 5	4,053	1	1	[2·5]
	Uj-Kécske	„ 15	6,723	5	4	5·9
	Vecsés	„ 19	3,271	1	—	—
	Új-Pest	„ 24	23,521	4	3	1·3
	Alsó-Némedi	„ 25	3,211	3	2	6·2
	Csömör	„ 25	2,435	1	1	[4·1]
	Üjszász	„ 25	3,535	2	2	5·7
	Soroksár	„ 29	12,143	1	1	[0·8]
	Péczel	Oct. 2	2,752	2	1	[3·6]
	Kóka	„ 12	3,465	5	4	11·5
	Nagy-Káta	„ 12	6,028	1	1	[1·7]
	Tó-Almás	„ 12	2,112	5	4	19·0
	Tököl	„ 12	2,017	1	1	[5·0]
	Sziget-Monostor	„ 15	1,882	1	1	[8·5]
	Ráczkeve	„ 17	5,861	2	2	3·4
	Foktö	„ 18	3,535	4	2	5·7
	Bátya	„ 19	3,470	1	1	[2·9]
	Sári	„ 21	2,328	1	1	[4·3]
	Makád	„ 22	1,641	1	1	[6·1]
	Erzsébetfalu	„ 24	5,650	3	3	5·3
	Solt	„ 25	6,502	1	1	[1·5]
	Üllö	„ 28	3,033	4	2	6·6
	Tápió-Sáp	Nov. 16	1,686	1	—	—
			261,494	97	63	2·6
Vas	Sárvár	Aug. 3	2,491	1	—	—
	Röt	Nov. 8	591	1	1	[16·9]
	Csajta	„ 15	862	3	2	23·2
			3,944	5	3	7·6

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Somogy	Szulok	Aug. 8	1,996	1	1	*[5·0]*
	Magyar-Atád	Oct. 28	844	1	—	—
			2,840	2		*[3·5]*
Bars	Nagy-Sáró	Aug. 8	1,006	1	—	—
	Nagy-Lót	Nov. 8	1,287	6	2	*15·5*
	Zsitva-Gyarmat	„ 16	645	1	—	—
			2,938	8	2	*6·8*
	SZEGED	Aug. 8	85,569	46	37	*4·3*
Besztercze-Naszód.	Magura	Aug. 9	1,175	7	4	*34·0*
	Teles	Nov. 21	2,611	16	4	*15·3*
	Magyar-Nemegye	„ 26	1,076	1	—	—
			4,862	24	8	*16·5*
	SELMECZ-ÉS-BÉLABÁNYA.	Aug. 10	15,280	2	1	*[0·6]*
Torontál	Josefova	Aug. 11	2 273	10	7	*30·8*
	Szerb-Keresztúr	„ 14	2,677	1	1	*[3·7]*
	Török-Kanizsa	„ 14	3,429	2	1	*[2·9]*
	Szanád	„ 21	2,183	11	9	*41·3*
	Aracs	„ 23	7,550	6	5	*6·6*
	Török-Becse	„ 24	7,276	11	8	*11·0*
	Kumán	„ 25	5,468	14	9	*16·5*
	Nagy-Becskerek	„ 25	21,934	8	3	*1·4*
	Magyar-Pádé	„ 27	1,600	1	1	*[6·2]*
	Szöreg	„ 27	3,337	8	6	*18·0*
	Melencze	„ 29	8,691	43	28	*32·2*
	Antalfalva	Sept. 2	4,271	23	18	*42·2*
	Ozora	„ 3	5,935	7	6	*10·1*
	Tarrasz	„ 3	1,513	3	2	*13·2*
	Német-Párdány	„ 9	1,744	1	1	*[5 7]*
	Szerb-Párdány	„ 9	1,925	1	1	*[5·2]*
	Csóka	„ 12	3,330	14	11	*33·0*
	Farkasd	Oct. 7	2,014	91	46	*228·5*
	Nagy-Kikinda	„ 17	22,768	9	8	*3·5*
	Basahid	„ 18	4,192	35	26	*62·1*
	Perlasz	„ 18	4,583	2	1	*[2·2]*
	Lagosmajor (tanya)	„ 21	112	29	14	*1250·0*
	Orlovát	„ 21	2,099	1	—	—
	Ernesztháza	„ 22	2,120	16	10	*47·2*
	Puszta kerités	„ 22	1,078	4	2	*37·3*
	Öregfalu	„ 23		1	1	
	Dávidház	„ 23		7	1	
	Katalinfalva	„ 23	2,392	2	2	*8·4*
	Kis-Torák	„ 24	2,963	2	2	*6·8*
	Ujvár	„ 28	1,885	3	2	*10·6*
	Nagy-Torák	Nov. 6	3,595	1	—	—
			134,927	367	232	*17·2*

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Kis-Küküllő.	Maros-Ugra	Aug. 12	1,144	7	6	52·5
	Kerelő-Szent-Pál	„ 23	861	13	7	81·3
	Kerelő	„ 25	487	8	5	102·7
	Csapó	„ 29	895	2	1	[10·2]
	Bábahalma	Sept. 12	1,177	1	1	[8·5]
			4,564	31	20	43·8
Maros-Torda.	Szász-Régen	Aug. 12	6,057	2	2	3·3
	Abafája	„ 19	1,048	6	2	19·1
	Malomfalva	„ 24	533	3	3	56·3
	Mező-Sámsond	Sept. 4	2,008	3	3	14·9
	Somosd	„ 27	886	1	1	[11·3]
			10,532	15	11	10·4
	MAROS-VÁSÁRHELY	Aug. 15	14,212	1	1	[0·7]
Fejér	Martonvásár	„ 16	2,095	2	1	[4·8]
	Érd	„ 17	3,368	3	2	5·9
	Ercsi	„ 18	5,678	1	1	[1·8]
	Iváncsa	„ 21	1,795	8	6	33·4
	Rácz-Almás	„ 25	3,599	7	3	8·3
	Duna-Pentele	Sept. 2	3,637	7	5	13·8
	Lovas-Berény	„ 2	3,600	1	1	[2·8]
	Vál	„ 3	3,017	1	—	—
	Ettyek	Oct. 17	2,748	2	2	7·3
	Herczegfalva	„ 19	7,316	1	1	[1·4]
	Nagy-Perkáta	„ 25	3,549	1	1	[2·8]
			40,397	34	28	5·7
Bács-Bodrog.	Zenta	Aug. 17	25,725	24	17	6·6
	Kis-Szállás	„ 18	1,794	1	—	—
	O-Becse	„ 18	16,965	70	45	26·5
	Mohol	„ 20	9,509	30	22	23·2
	Petrovoszelló	„ 22	8,616	39	24	27·8
	Csantavér	„ 22	6,212	1	—	—
	Monostorszeg	„ 25	5,424	1	1	[1·8]
	Keresztúr	„ 25	5,088	1	—	—
	Ó-Moravicza	„ 26	6,285	1	1	[1·6]
	Szonta	„ 26	4,972	1	—	—
	Ada	„ 27	11,074	13	18	11·8
	Csurogh	„ 28	7,773	34	26	33·4
	Zsablya	„ 28	6,697	3	3	4·5
	Feketehegy	„ 29	5,169	2	2	3·9
	Ó-Kanizsa	„ 29	15,494	1	—	—
	Lok	Sept. 7	949	1	1	[10·5]
	Felső-Kovil	„ 10	4,768	1	1	[2·1]
	Martonos	„ 10	5,725	1	1	[1·7]
	Mélykút	„ 11	7,919	5	5	6·3
	Tisza-Földvár	„ 11	5,716	10	6	10·5

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Bács-Bodrog—*cont.*	Goszpodincze - -	Sept. 18	2,948	5	3	*10·2*
	Temerin - -	„ 27	8,543	3	3	*3·5*
	Bajsa - -	„ 28	3,848	1	1	[*2·6*]
	Turia - - -	Oct. 26	3,161	1	1	[*3·2*]
	Vaskút - -	„ 26	5,258	1	1	[*1·9*]
	Ó-Sóvé - -	„ 31	2,136	1	1	[*4·7*]
	Új-Sóvé - -	„ 31	2,260	3	3	*13·3*
	Ó Kér - -	Nov. 4	3,975	1	—	—
	Rácz-Militics -	„ 4	3,428	7	6	*17·5*
	Jankovácz - -	„ 5	9,116	13	6	*6·6*
			208,827	277	194	*9·3*
Békés -	Békés-Csaba -	Aug. 19	34,243	1	1	[*0·3*]
	Orosháza - -	„ 19	19,956	41	22	*11·0*
	Békés - -	„ 20	25,087	2	2	*0·8*
	Tót-Komlós -	Sept. 13	9,636	1	1	[*1·0*]
	Gyula - - -	„ 25	19,991	3	3	*1·5*
			108,913	48	29	*2·7*
	Debreczen -	Aug. 18	56,940	6	4	*0·7*
Brassó -	Brassó - -	Aug. 20	30,739	26	19	*6·2*
	Volkány - -	Sept. 20	1,567	1	1	[*6·4*]
	Höltövény -	Oct. 11	2,449	1	1	[*4·1*]
	Szent-Péter - -	Nov. 9	1,871	1	1	[*5·3*]
			36,626	29	22	6·0
	Kecskemét ·	Aug. 23	48,493	2	2	*0·4*
Moson -	Nyulas - -	Aug 24.	1,235	1	1	[*8·1*]
	Lipót - - -	Oct. 8	930	12	8	*86·0*
	Hegyes-Halom -	„ 24	2,196	1	—	—
			4,361	14	9	*20·6*
Árva -	Felsö-Zubricza -	Aug. 29	1,420	4	4	*28·1*
	Felsö-Lipnicza -	„ 30	1,681	2	1	[*6·1*]
	Árva-Váralja -	Nov. 23	373	6	4	*107·2*
			3,424	12	9	*26·3*
Krassó Szörèny	Lugos - -	Aug. 29	12,489	3	2	*1·6*
	Hódmezövásárhely.	Aug. 31	55,475	3	3	*0·5*

TABLE B.—(2.) HUNGARY—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Baranya	Illocska	Sept. 1	642	1	—	—
	Pécsvárad	Oct. 19	3,016	29	13	*43·1*
	Duna-Szekcső	„ 27	5,385	1	1	[*1·9*]
	Somberek	Nov. 8	2,240	1	1	[*4·5*]
	Mohács	„ 5	14,403	2	2	*1·4*
			25,686	34	17	*6·6*
Veszprém	Gicz	Sept. 1	524	1	—	—
	Enying	„ 7	3,455	1	—	—
			3,979	2	—	—
	ARAD	Sept. 1	42,052	1	1	[*0·2*]
Gömör	Putnok	Sept. 4	3,128	1	1	[*3·2*]
	Trizs	„ 3	301	1	1	[*33·2*]
			3,429	2	2	*5·8*
Alsó-Fehér	Maros-Gezse	Sept. 4	1,067	15	10	*93·7*
	Kis-Solymos	„ 5	164	1	1	[*61·0*]
	Czintos	„ 18	685	4	4	*58·9*
	Nagy-Enyed	„ 24	5,932	1	1	[*1·7*]
	Magyar-Csesztve	Oct. 4	611	1	1	[*16·4*]
	Maros-Ujvár-Akna	„ 22	3,418	1	1	[*2·9*]
	Gyula-Fehérvár	Nov. 27	8,167	1	1	[*1·2*]
			20,044	24	19	*9·5*
	UJVIDÉK	Sept. 9	24,717	2	2	*0·8*
Fogaras	Zernest	Sept. 10	3,435	2	2	*5·8*
Torda-Aranyos.	Topánfalva	Sept. 12	2,431	1	1	[*4·1*]
	Maros-Bogát	„ 19	2,486	43	28	*112·7*
	Maros-Ludas	„ 20	2,393	15	13	*54·3*
	Gyéres	„ 26	1,608	1	1	[*6·2*]
	Maros-Kecze	Oct. 3	950	10	8	*84·2*
	Székely-Kocsárd	„ 14	1,431	1	1	[*7·0*]
	Mező-Szent-Margita	„ 30	239	2	2	*83·6*
	Mező-Szengyel	Nov. 4	1,515	1	—	—
			13,053	74	54	*41·4*

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Sáros	Alsó-Sebes	Sept. 17	480	1	1	[20·5]
	Töltszék	„ 29	799	2	1	[12·5]
	Sebes-Váralja	Oct. 7	231	1	—	—
	Felsö-Sebes	„ 8	516	1	1	[19·4]
	Deméte	„ 13	443	12	9	203·2
	Eperjes	„ 24	10,371	1	1	[1·0]
	Kapi	„ 26	807	2	1	[12·4]
			13,647	20	14	10·3
Zala	Nagy-Kanizsa	Sept. 30	7,811	1	—	—
	Nagy-Récse	Oct. 26	1,044	1	—	—
			8,855	2	—	—
Pozsony	Hódos	Oct. 2	997	1	1	[10·0]
Liptó	Rózsahegy	Oct. 3	6,879	2	1	[1·5]
	Csernova	„ 7	1,289	17	11	85·3
			8,168	19	12	14·7
Esztergom	Esztergom	Oct. 4	9,349	1	—	—
	Szent-Györgymezö	„ 24	2,698	1	1	[3·7]
	Nyerges-Ujfalu	Nov. 5	2,468	1	1	[4·1]
			14,515	3	2	1·4
Szeben	Nagy-Szeben	Oct. 4	21,465	3	3	1·4
	Szakadát	„ 5	1,145	5	4	35·0
	Bongárd	„ 18	684	1	—	—
	Felsö-Sebes	„ 25	921	1	1	[10·9]
	Szász-Ujfalu	„ 29	989	1	1	[10·1]
			25,204	11	9	3·6
Nagy-Küküllö	Pálos	Oct. 15	893	1	1	[11·4]
Szepes	Gnézda	Oct. 15	1,168	3	1	[8·6]
	Kamjonka	„ 17	1,457	9	4	27·5
			2,625	12	5	19·1
Komárom	Cserhát puszta	Oct. 16	876	5	4	45·7
	Imely	„ 17	1,389	1	1	[7·2]
	Udvard	„ 17	4,174	1	1	[2·4]
	Keszegfalva	„ 29	1,187	2	2	16·8
			7,626	9	8	10·5

Table B.—(2.) Hungary—*continued.*

County.	Town or Village (Municipal Towns printed in Small Capitals).	Date of first recorded Case of Cholera, 1893.	Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
	KOMÁROM - -	Oct. 16	13,076	9	8	*6·1*
	BAJA - -	Oct. 16	19,485	5	1	[*0·5*]
Győr -	Kis-Baráthegy -	Oct. 17	1,231	2	2	*16·2*
	Gönyü - -	„ 27	1,508	1	1	[*6·6*]
	Győrsziget - -	Nov. 5	4,967	1	1	[*2·0*]
			7,706	4	4	*5·2*
	SZÉKES-FEJÉRVÁR	Oct. 27	27,548	2	2	*0·7*
Hont - -	Egeg - -	Oct. 28	543	1	1	[*18·4*]
	PÉCS - -	Oct. 28	34,067	2	1	[*0·3*]
Háromszék -	Hidvég. Nyárospatak-telep.	Nov. 6	1,756	8	2	*11·4*
	TEMESVÁR - -	Nov. 7	39,884	2	—	—
Trencsén -	Lissza - -	Nov. 8	1,818	3	2	*11·0*

(3.) Bosnia.

(a.) *First or Eastern Invasion.*

County.	Town or Village.	Date of		Population.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
		First recorded Case of Cholera, 1893.	Last recorded Case of Cholera, 1893.		Attacks.	Deaths.	
	DISTRICT OF TUZLA.						
Brčka -	Brčka -	Sept. 22	Oct. 20	4,281	84	45	*105·1*
	Maoča - -	„ 23	Dec. 27	544	48	28	*515·0*
	Obudovac Cerovopolje	„ 24	Oct. 16	492	19	9	*183·0*
	Vukšić -	„ 29	Dec. 23	686	19	8	*116·6*

Table B.—(3.) Bosnia—*continued.*

County.	Town or Village.	Date of First recorded Case of Cholera, 1893.	Date of Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	District of Tuzla—*cont.*						
Brčka—*cont.*	Gorica - -	Oct. 2	Oct. 2	344	1	1	[*29·1*]
	Vitanovič dolnji.	„ 3	Dec. 5	218	6	1	[*45·9*]
	Vidovice -	„ 5	Oct. 20	972	4	2	*20·6*
	Skakava dolnje	„ 6	Dec. 31	750	42	15	*200·0*
	Brka - -	„ 6	„ 13	723	8	5	*69·2*
	Dolja Mahala	„ 6	Oct. 17	2,144	6	2	*9·3*
	Kostrć - -	„ 7	„ 14	603	2	1	[*16·6*]
	Rahić - -	„ 7	Nov. 24	1,020	16	6	*58·8*
	Bjela - -	„ 8	Dec. 28	263	20	6	*228·0*
	Štriepci - -	„ 10	Nov. 2	290	4	—	—
	Brezovopolje -	„ 10	„ 9	1,363	10	4	*29·3*
	Dubrave -	„ 10	Oct. 19	417	6	2	*48·0*
	Palanka -	„ 11	Nov. 2	592	10	7	*118·2*
	Pirkovci -	„ 11	Oct. 11	271	1	1	[*37·0*]
	Orašje -	„ 12	„ 12	793	1	1	[*12·6*]
	Čerik - -	„ 13	Nov. 28	184	2	1	[*54·3*]
	Čelić - -	„ 15	Dec. 13	1,409	15	13	*92·3*
	Brod - -	„ 17	Oct. 19	142	3	—	—
	Brezije - -	„ 17	„ 22	90	2	1	[*111·0*]
	Ulović - -	„ 9	Dec. 15	250	5	3	*120·0*
	Tolisa - -	„ 17	Oct. 20	1,855	5	3	*22·1*
	Ulice Bukovac	„ 14	Dec. 16	599	11	3	*50·2*
	Krepsić - -	„ 18	Oct. 18	472	1	—	—
	Kopanice -	„ 20	„ 20	558	1	—	—
	Bukvik dolnji	Nov. 23	Dec. 9	224	11	5	*223·0*
	Grabavica -	Dec. 1	„ 15	195	3	—	—
	Bukvik gornji	„ 4	„ 4	241	3	—	—
	Kozjak - -	„ 2	„ 23	152	3	1	[*65·8*]
				22,632	372	174	*76·9*
Gradačac	Gradačac -	Sept. 25	Dec. 13	3,076	66	35	*113·9*
	Domaljevac dolnji.	„ 25	Nov. 2	972	28	8	*82·3*
	Čardak Tramośnica dolnja.	Oct. 2	Oct. 23	319	22	12	*376·5*
	Špionica -	„ 4	Dec. 5	1,065	28	23	*216·0*
	Blaževac -	„ 6	Oct. 7	153	2	2	*130·8*
	Porebrica -	„ 8	„ 19	521	4	1	[*19·2*]
	Vučkovac dolnji.	„ 11	Nov. 9	534	17	12	*225·0*
	Gušte - -	„ 14	Oct. 14	130	1	1	[*77·0*]
	Žabar gornji	„ 14	Dec. 15	1,689	10	4	*23·7*
	Samarevac -	„ 14	Oct. 20	152	10	3	*197·4*
	Zelinja gornja	Oct. 14	Nov. 9	744	3	2	*25·9*
	Srebrenik -	„ 16	Dec. 10	951	50	21	*220·1*
	Hasić -	„ 29	Oct. 29	336	1	1	[*29·8*]
	Garevac -	Nov. 19	Nov. 19	696	1	1	[*14·4*]
	Prud - -	Dec. 16	Dec. 16	576	1	—	—
				11,914	244	126	*105·8*

Table B.—(2.) Bosnia—*continued.*

County.	Town or Village.	Date of: First recorded Case of Cholera, 1893.	Date of: Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	District of Tuzla—*cont.*						
Tuzla	Dubrave katol	Oct. 4	Oct. 4	227	1	—	—
	Dokanj	„ 8	„ 11	386	2	2	*51·8*
	Dolnja Tuzla	„ 9	Nov. 26	7,189	53	35	*48·7*
	Ljenobud gornji.	„ 9	Dec. 26	267	10	6	*225·0*
	Breške	„ 11	Oct. 11	399	1	1	[*25·1*]
	Solina	„ 15	„ 23	53	2	2	*377·5*
	Lipnica katol	„ 16	Nov. 6	678	3	2	*29·5*
	Tinja	„ 25	„ 12	374	18	10	*267·5*
	Gornji Tuzla	„ 27	„ 10	1,611	2	2	*12·4*
	Seona	Nov. 10	„ 12	675	5	2	*29·6*
	Simin Han	„ 22	„ 22	50	1	—	—
	Ljenobud dolnji.	Dec. 20	Dec. 27	221	6	4	*181·0*
	Zahirović	„ 22	„ 22	181	1	—	—
				12,261	105	66	*53·9*
Gračanica	Sokol	Oct. 5	Oct. 14	794	3	2	*25·2*
	Gornja Orahovica.	„ 9	„ 23	1,331	18	5	*37·6*
	Gračanica	„ 7	Dec. 7	3,350	28	13	*38·9*
	Sladna	„ 12	Oct. 25	964	2	2	*20·8*
	Kakmuz	„ 13	„ 22	669	2	—	—
	Krtova	„ 13	„ 13	470	1	1	[*21·3*]
	Čekanic	„ 17	„ 17	241	1	1	[*41·5*]
	Skipovac	„ 18	„ 18	779	1	1	[*12·8*]
	Malešic turski	„ 21	Nov. 12	613	14	6	*97·9*
	Stiepanopolje	„ 23	Oct. 31	716	3	2	*28·0*
	Dobrovci	„ 25	Nov. 17	533	4	3	*56·3*
	Rapatnica	„ 29	„ 14	344	9	7	*203·6*
	Piskovica	Nov. 4	„ 4	149	1	—	—
	Sočkovac	„ 5	„ 5	314	1	—	—
	Briesnica	„ 23	„ 23	909	1	1	[*11·0*]
				12,176	84	44	*36·2*
Bjelina	Vršani	Oct. 10	Oct. 12	644	2	1	[*15·5*]
	Koraj	„ 10	„ 10	1,483	1	—	—
	Bjelina	„ 12	„ 12	7,807	2	1	*2·6*
	Janja	„ 21	„ 21	3,488	1	—	—
	Ugljevik	„ 9	„ 9	915	1	—	—
	Puškovac	Nov. 9	Nov. 9	338	1	—	—
				14,675	8	3	*2·0*

Table B.—(3.) Bosnia—*continued.*

County.	Town or Village.	Date of: First recorded Case of Cholera, 1893.	Date of: Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death-rate per 10,000 Population, 1893.
	District of Tuzla—*cont.*						
Zvornik	Priboj	Oct. 11	Oct. 14	963	3	2	*20·8*
	Tobut	„ 21	„ 21	762	1	1	*[13·1]*
	Glavičica	Dec. 2	Jan. 2, 1894.	511	8	7	*137·0*
	Piliće	„ 10	Dec. 14	982	3	—	—
	T. Kamenica	„ 28	„ 28	689	1	1	*[14·5]*
				3,907	16	11	*28·1*
Maglaj	Prav. Suhopolje	Oct. 13	Oct. 23	173	7	2	*15·6*
	Prav. Gostović	„ 31	Nov. 18	266	3	2	*75·3*
	Hrge	Nov. 11	„ 23	558	5	1	*[17·9]*
	Gare	Dec. 3	Dec. 6	302	2	1	*[33·1]*
				1,299	17	6	*46·2*
Vlasenica	Šajtovići	Nov. 23	Dec. 18	231	22	7	*303·0*
	Like	„ 27	„ 26	77	3	3	*389·0*
	Brainci	Dec. 16	„ 29	736	9	5	*68·0*
				1,044	34	15	*143·7*
	District of Sarajevo.						
Sarajevo	Sarajevo	Oct. 13	Oct. 13	27,000	1	1	*[0·4]*
	District of Banjaluka.						
Dervent	Dervent	Oct. 19	Dec. 7	4,450	21	10	*22·5*
	Velika	Nov. 23	Nov. 23	257	1	1	*[38·9]*
				4,707	22	11	*23·4*

Table B.—(3.) Bosnia—*continued.*

(*b.*) *Second or Western Invasion.*

County.	Town or Village.	Date of: First recorded Case of Cholera, 1893.	Date of: Last recorded Case of Cholera, 1893.	Population.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death rate per 10,000 Population, 1898.
	District of Travnik.						
Bugojno -	D. Vakuf -	Nov. 3	Dec. 10	1,970	15	9	*45·7*
	Zloselo - -	„ 16	Nov. 16	860	1	1	*[11·6]*
	Gornji Vakuf	„ 24	„ 26	1,694	2	2	*11·8*
	Voljice - -	„ 29	„ 29	275	1	—	—
	Sarajvilić -	„ 30	„ 30	167	1	1	*[60·0]*
	Oborci - -	Dec. 3	Dec. 14	455	5	3	*65·9*
				5,421	25	16	*29·5*
	Railway works D. Vakuf-Jajce	Nov. 5	Dec. 1	2,000	47	18	*90·0*
Travnik -	Mosunj dol -	Nov. 3	Nov. 7	150	2	1	*[66·6]*
	District of Banjâluka.						
Banjaluka -	Bočac - -	Nov. 12	Dec. 16	811	9	4	*49·3*
	Aginoselo -	„ 21	„ 11	780	9	3	*38·5*
	Banjaluka -	Dec. 10	„ 10	13,360	1	1	*[0·7]*
				14,951	19	8	*5·4*
Kotor Varoš	Javorani -	Nov. 24	Dec. 12	688	6	4	*28·5*
	Saninovići -	„ 29	„ 7	91	3	2	*220·0*
	Zaselje -	„ 30	Nov. 30	242	1	1	*[41·3]*
				1,021	10	7	*68·5*
Tesanj -	‘Cifčije -	Nov. 27	Nov. 27	176	1	1	*[56·8]*
	‘Cavka Forest District.	Dec. 4	Dec. 12	500	6	4	*80·0*
				676	7	5	*74·0*
Prnjavov -	Martinci -	Dec. 2	Dec. 2	228	1	—	—

Table C.

Cholera in Belgium during 1893.

Communes.	Date of first recorded Case of Cholera, 1893.	Population, Census 1890.	Total recorded Cholera: Attacks.	Total recorded Cholera: Deaths.	Cholera Death-rate per 10,000 Population, 1893.
PROVINCE OF HAINAUT.					
Mont-sur-Marchienne	July 8	6,752	15	9	*13·3*
Châtelet	Aug. 16	11,176	3	2	*1·8*
Lessines	„ 18	8,225	2	1	[*1·2*]
Dampremy	Sept. 12	8,941	27	18	*20·1*
Marchienne-au-Pont	„ 15	15,157	73	47	*31·0*
Villers-Poterie	„ 21	627	3	1	[*15·9*]
Charleroy	„ 21	20,668	44	23	*11·1*
Lodelinsart	„ 23	7,629	8	3	*3·9*
Obaix-Buzet	„ 27	1,815	1	—	—
Jumet	„ 28	23,927	2	—	—
Quiévrain	„ 30	3,831	1	—	—
Montignies-sur-Sambre	Oct. 3	15,479	15	7	*4·5*
Couillet	„ 4	8,326	6	2	*2·4*
Châtelineau	„ 17	10,188	20	12	*11·8*
Landelies	„ 20	1,827	1	1	[*5·5*]
Morlanwelz	„ 22	7,307	2	—	—
Marcinelle	„ 9	11,187	6	5	*4·5*
			224	131	
PROVINCE OF LIÉGE.					
Flémalle-Grande	July 6	4,602	1	1	[*2·2*]
Liége	Aug. 19	147,660	5	4	*0·3*
Oraye	„ 25	603	1	—	—
Saint-Nicolas	Sept. 1	6,547	1	1	[*1·5*]
Xhoris	„ 5	859	1	—	—
Dison	„ 6	13,221	1	—	—
Huy	Nov. 10	14,486	1	—	—
Angleur	„ 23	5,902	1	—	—
			12	6	
PROVINCE OF FLANDRE ORIENTALE.					
Alost	July 6	25,544	8	2	*0·8*
Termonde	„ 20	9,606	8	3	*3·1*
Steendorp	„ 24	2,932	1	1	[*3·4*]
Olsene	„ 29	2,107	1	1	[*4·7*]
Rupelmonde	Aug. 1	3,182	21	8	*25·1*
Zele	„ 2	12,293	1	—	—
Burght	„ 13	2,570	21	11	*42·8*
Cruybeke	„ 17	3,417	1	1	[*2·9*]
Melsele	„ 18	3,440	2	2	*5·8*
Gand	„ 21	148,729	1	1	[*1·1*]
Meirelbeke	„ 21	4,848	2	1	[*2·1*]
Hamme	„ 21	12,039	5	3	*2·5*
Kemseke	„ 21	1,847	1	1	[*5·4*]
Hofstade	„ 23	2,257	1	1	[*4·4*]
Berchem	„ 23	1,989	1	—	—
Stekene	„ 24	7,512	1	1	[*1·3*]
Exaerde	„ 25	4,967	1	1	[*2·0*]

TABLE C.—*continued.*

Communes.	Date of first recorded Case of Cholera, 1893.	Population, Census 1890.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
			Attacks.	Deaths.	
Grembergen - - -	Aug. 25	2,662	1	1	*[3·8]*
Audenarde - - -	„ 28	6,141	1	—	—
Calloo - - -	„ 29	2,930	1	1	*[3·4]*
Zwyndrecht - - -	Sept. 2	4,619	1	1	*[2·2]*
Appels - - -	„ 2	1,597	5	—	—
Herdersem - - -	„ 12	1,483	1	—	—
Tamise - - -	„ 13	11,039	4	1	*[0·9]*
Selzaete - - -	„ 17	5,241	6	4	*7·6*
Denderwindeke - -	„ 29	2,980	2	1	*[3·3]*
			89	47	
PROVINCE OF FLANDRE OCCIDENTALE.					
Courtrai - - -	July 10	30,383	3	2	*0·7*
Pitthem - - -	Sept. 12	5,003	1	—	—
Bruges - - -	„ 28	47,497	2	2	*0·4*
			6	4	
PROVINCE OF NAMUR.					
Andenne - - -	July 15	7,075	1	—	—
St. Marc - - -	Aug. 18	660	1	—	—
Gembloux - - -	„ 28	3,956	1	—	—
Tamines - - -	Oct. 8	3,305	1	1	*[3·0]*
Malonne - - -	„ 15	2,916	1	1	*[3·4]*
Florennes - - -	„ 21	2,552	5	2	*7·8*
Namur - - -	Dec. 12	30,087	5	3	*1 0*
Beez - - -	„ 22	621	1	1	*[16·1]*
			16	8	
PROVINCE OF ANVERS.					
Anvers - - -	July 28	224,012	119	75	*3·3*
Borgerhout - - -	Aug. 7	28,882	4	2	*0·7*
Hingene - - -	„ 13	3,739	9	8	*21·4*
Mariakerke - - -	„ 17	1,222	1	1	*[8·2]*
Hemixem - - -	„ 18	3,676	6	6	*16·3*
Bereudrecht - - -	„ 19	2,450	1	1	*[4·1]*
Weert - - -	„ 23	752	1	1	*[13·3]*
Wyneghem - - -	„ 26	2,868	8	4	*13·9*
Stabroeck - - -	„ 27	3,647	20	13	*35·6*
Niel - - -	„ 28	6,020	5	4	*6·5*
Willebroeck - - -	Sept. 1	8,164	22	18	*21·4*
Duffel - - -	„ 4	5,934	1	—	
Boom - - -	„ 5	13,892	14	7	*5·0*
Schelle - - -	„ 10	2,020	4	2	*9·9*
Rethy - - -	„ 10	2,639	1	—	—
Moll - - -	„ 10	6,811	4	1	*[1·6]*
Austruweel - - -	„ 22	604	1	1	*[16·5]*
Merxem - - -	„ 27	8,453	1	1	*[1·2]*
Turnhout - - -	Oct. 28	18,747	1	—	—
			223	145	

Table C.—*continued.*

Communes.	Date of first recorded Case of Cholera, 1893.	Population, Census 1890.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
			Attacks.	Deaths.	
Province of Limbourg.					
Lanaeken - - -	Aug. 16	2,766	2	2	*7·2*
Saint-Troud - -	Dec. 18	12,895	1	1	[*0·8*]
			3	3	
Province of Brabant.					
Molenbeek-Saint-Jean -	Sept. 14	48,723	9	7	*1·4*
Steenockerzeel - -	„ 18	1,926	1	—	—
Anderlecht - -	„ 23	32,311	3	3	*0·9*
Thildonck - - -	„ 24	1,295	1	—	—
Velthem-Beyssem - -	„ 25	1,275	3	1	[*7·8*]
Saint-Gilles - -	„ 25	40,289	14	8	*2·0*
Neder-over-Heembeek -	„ 26	2,224	1	1	[*4·5*]
Glabais - - -	Oct. 2	895	2	2	*22·3*
Vlesembeek - -	„ 11	1,887	1	—	—
Hamme-Mille - -	„ 15	982	1	1	[*10·2*]
Hal - - -	„ 15	10,441	1	1	[*0·95*]
Londerzeel - -	„ 26	4,707	2	2	*4·2*
Gammerages - -	Nov. 2	2,353	1	—	—
Etterbeek - - -	Dec. 1	17,785	2	2	*1·1*

TABLE D.

CHOLERA in ROUMANIA in 1893.

Province.	Town or Village (Municipal Towns printed in small capitals).	Date of first recorded Case of Cholera, 1893.	Population, Census 1889–90.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Brăila	BRĂILA	July $\frac{7}{19}$	46,715	469	290	62·1
	Islazu	„ $\frac{18}{30}$	5,162	51	31	60·2
	Românul	„ $\frac{18}{30}$	1,255	20	20	—
	Cazasu	Aug. $\frac{9}{21}$	1,834			
	Tichilesci	„ $\frac{11}{23}$	1,461			
	Surdila Găisénca	„ $\frac{12}{24}$	1,245			
	Chişcani	„ $\frac{14}{26}$	882			
	Silistraru	„ $\frac{14}{26}$	1,769			
	Nazăru	„ $\frac{14}{26}$	907			
	Scotaru-Vechiŭ	„ $\frac{15}{27}$	937			
	Chichinețu	Aug. 22 Sept. 3	1,043			
	Cióra	Aug. 23 Sept. 4	1,637			
	Pleaşca	„ $\frac{16}{28}$	908			
	Ianca	„ $\frac{17}{29}$	1,483			
	Vadeni	„ $\frac{18}{30}$	770			
	Ciacăru	„ $\frac{18}{30}$	1,618			
	Gropeni	Oct. $\frac{7}{19}$	1,956	24	11	56·2
	Valea Cânipeĭ	„ $\frac{8}{20}$	1,019	17	9	88·2
Tulcea	SULINA	July 22 Aug. 3	4,317	319	155	358·8
	TULCEA	July 31 Aug. 12	17,257	85	27	15·6
	MĂCIN	Aug. 28 Sept. 4	3,360	5	4	11·9
	CHILIA-VECHE	Aug. 27 Sept. 8	2,075	8	6	28·9
	MAHMUDIA	„ $\frac{6}{18}$	1,258	1	1	[7·9]
	ISACCEA	Oct. $\frac{7}{19}$	3,072	1	1	[3·3]
Constanța	CERNAVODA AND Feteşti.*	July 23 Aug. 4	1,553 1,236	155	89	319·5
	Seimeni	„ $\frac{18}{30}$	1,019	9	4	39·3
	Ostrov	Sept. $\frac{17}{29}$	1,188	1	1	[8·4]
Covurluiŭ	GALAȚI	July 24 Aug. 5	59,143	155	95	16·1
Neamțu	Zănesci	„ $\frac{1}{13}$	2,038	1	1	[4·9]
	PIATRA	„ $\frac{4}{16}$	20,000	13	3	1·5
	Costişa	„ $\frac{16}{28}$	1,737	1	1	[5·8]
	Rădiu	„ $\frac{12}{24}$	1,246	1	1	[8·0]
	Bistricioara	Aug. 23 Sept. 4	1,743	1	1	[5·7]
	Buhuşu	Aug. 28 Sept. 9	3,155	2	2	6·3
Ialomița	CĂLĂRAŞĬ	Aug. $\frac{3}{15}$	8,125	32	21	25·9
	Piua-Petri	„ $\frac{14}{26}$	1,578	18	11	69·6
	Cocargeaua	Aug. 31 Sept. 12	2,515	1	1	[4·0]
	Cegani	Aug. 31 Sept. 12	1,200	7	5	41·7
	Gura-Ialomițeĭ	„ $\frac{5}{17}$	812	2	—	—
	Tonea	?	1,483	3	3	20·2
	Vlădeni	Oct. $\frac{2}{14}$	984	15	9	91·4
	Luciu	„ $\frac{2}{14}$	1,007	4	1	[9·9]

* Feteşti is situate in the Province of Ialomita.

TABLE D.—*continued.*

Province.	Town or Village (Municipal Towns printed in small capitals).	Date of first recorded Case of Cholera 1893.	Population, Census 1889-90.	Total recorded Cholera		Cholera Death-rate per 10,000 Population, 1893.
				Attacks.	Deaths.	
Putna - -	Sascut - -	Aug. $\frac{7}{19}$	2,414	14	9	*37·3*
	Vulturu - -	„ $\frac{12}{24}$	2,831	2	1	[*3·5*]
	Nomolósa -	„ $\frac{19}{31}$	1,481	3	3	*20·3*
	FOCŞANĬ - -	Sept. 26 Oct. 8	17,039	4	2	*1·2*
Dorohoiŭ -	HERTA - -	Aug. $\frac{4}{16}$	2,919	19	11	*37·7*
	Movila - -	„ $\frac{11}{23}$	1,911	19	12	*62·8*
	Pilipăuţi - -	„ $\frac{17}{29}$	2,583	5	2	*7·7*
	Târnauca - -	„ $\frac{12}{24}$	4,093	2	2	*4·9*
	Oroftiana -	?	1,259	1	—	—
Vlaşca -	GIURGIU - -	Aug. $\frac{15}{27}$	12,559	19	10	*8·0*
	Pângălesci -	Aug. 28 Sept. 9	722	1	1	[*13·9*]
Prahova - -	Netoti - -	Aug. $\frac{10}{22}$	1,277	12	6	*47·0*
Ilfov - -	BUCURESCI -	„ $\frac{18}{30}$	194,633	3	2	*0·1*
Tecuciŭ -	TECUCIŬ - -	„ $\frac{18}{30}$	9,261	1	1	[*1·1*]
	Umbrăresci -	Aug. 23 Sept. 4	2,021	3	2	*9·9*
Dolj - -	CALAFAT -	Aug. 20 Sept. 1	5,372	1	1	[*1·9*]
Buzĕŭ - -	MIZIL - -	Aug. 23 Sept. 4	5,198	2	1	[*1·9*]
Romanţi - -	CORABIA -	Aug. 30 Sept. 11	4,580	1	1	[*2·2*]
Mehedinţi -	SEVERIN - -	„ $\frac{2}{14}$	14,669	1	1	[*0·7*]

No. 1.

I.—FURTHER REPORT on the ETIOLOGY of TYPHOID FEVER; by DR. KLEIN, F.R.S.

In my report for last year (1893-94) I showed that when a cultivation of the typhoid bacillus, derived from the spleen of a case of typhoid fever in the human subject, is injected subcutaneously into the calf's groin, the only obvious pathological result in that animal is a swelling of the nearest lymph glands. Further, I showed that within these swollen glands, the typhoid bacilli retain their vitality for as long as 10 to 14 days; that is to say, if the juice and tissue of such a gland be during that time subjected to the culture test, a copious growth of the typical typhoid bacillus is obtained. From this it was inferred that, though the blood and spleen of the calf remained free from the bacilli, the microbe was nevertheless capable of growth and multiplication in the lymph glands of this animal.

The question that next presented itself was: Does this growth and multiplication of the typhoid bacillus in the inguinal lymph gland of the calf cause any changes in the nature of the blood and tissue-juices of that animal; or rather, does the microbe, whether by itself or through its life-processes, contribute to these tissues any substances capable of inhibiting multiplication of the typhoid bacilli themselves, or of neutralising their toxic products?

It is now established, and the matter will be referred to more in detail elsewhere in this volume, that when an animal serves as soil for the growth of a given pathogenic microbe, there are generated within it, by the metabolic processes of the microbe, definite chemical products which are that microbe's toxin. For the typhoid bacillus, Brieger was the first to demonstrate, but only in artificial cultures of the microbe, the presence of certain toxic subtances which he called typho-toxins; but, by analogy—looking, that is, to what is known of the modus operandi of anthrax, diphtheria, and tetanus,*—we are at liberty to infer that in natural cultures also, *i.e.*, in typhoid fever of the human subject, multiplication of the bacillus in the intestinal wall, in the mesenteric glands, and in the spleen, results in the generation of specific typho-toxins. A further important fact, or rather series of facts, brought forward by Behring and Kitasato, and confirmed by a large number of subsequent observers, (amongst whom are R. Pfeiffer, Roux, Roux and Vaillard, Tizzoni, and others), deserves notice. This is, that after an animal has served as soil for the growth of a particular pathogenic microbe, its blood and tissue-juices contain chemical substances which are not only capable of neutralizing the toxin that has been produced by that microbe, but are, some of them, inimical also to the growth and multiplication of the particular microbe. It is no doubt mainly owing to the presence of these substances (anti-toxic and germicidal bodies) that the attack ends in recovery, and that immunity is conferred by the attack which has been undergone.

The potency of these anti-toxic and germicidal bodies depends, *cæteris paribus*, on the severity or intensity of the attack which has been undergone, and this not only differs in different diseases but depends to a certain extent on the initial susceptibility of the animal. Thus, for instance, the horse, an animal not highly susceptible to diphtheria, only yields powerful anti-toxic bodies after many repeated subcutaneous injections with diphtheria bacillus. So that it is only after many artificially-induced attacks that its blood or blood serum acquires anti-toxic property towards diphtheria. And it is the same with tetanus in this animal, as shown by Behring, Roux and Vaillard. By intraperitoneal injection into guinea-pigs of non-fatal doses of cultures of the cholera vibrio, on the other hand, R. Pfeiffer finds that the blood of these animals soon (*i.e.*, after comparatively few injections) acquires potent protective property. This subject will be further discussed in another report in this volume.

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* *See* papers by Dr. Sidney Martin in the Reports of the Medical Officer for 1889–1894.

Since then, my experiments in 1893–94 had shown the inguinal lymph glands of the calf to be capable of serving as soil for the growth and multiplication of the typhoid bacillus, it was to be anticipated that by growing the microbe in this way there might be produced in the calf both anti-toxic bodies and germicidal substances, whether or not the one is included in the other.

Before entering on details of the experiments which I have made in calves, for the purpose of testing this anticipation, I give account of certain preliminary experiments made by me on the guinea-pig.

As regards this animal, R. Pfeiffer* had already obtained very striking results with the cholera vibrio. He found that the blood serum of guinea-pigs that had been repeatedly injected intraperitoneally with non-fatal doses of these microbes had acquired a decidedly germicidal property, so that when injected into the peritoneum of a normal guinea-pig it rendered the latter capable of withstanding subsequent or simultaneous injection (per peritoneum) of an otherwise fatal dose of the living vibrios.

My own experiments on the guinea-pig with the typhoid bacillus were the following :—

(*a.*) *Experiments with Guinea-pig Serum.*

1. The scrapings from the surface of an agar culture of the typhoid bacillus (measuring 6 by 2 centimetres), which had been incubated 48 hours at 37° C., were distributed in sterile bouillon, and the mixture sterilised by exposing the test-tube containing it to 65° C. for five minutes. One-fifth of the contents of such a tube is sufficient, when injected intraperitoneally, to produce illness in, but not to kill, a guinea-pig. This dose having been administered to a particular guinea-pig, the animal was ill on the evening of the day of injection, but was better the following day; after 48 hours it had quite recovered.

A week later, the animal was again intraperitoneally injected with an equal amount of the same kind of sterile culture as before. It again became slightly ill in the evening, but quite recovered in two days.

A fortnight later, the experiment was repeated with the same result.

Then, a week later, the animal was injected intraperitoneally with a fatal dose of *living* agar culture, *i.e.*, one that is sufficient to kill a normal guinea-pig. Again the animal was ill in the evening, but next morning had quite recovered.

After another week, injection with the living culture was repeated and this time the dose was about twice that ordinarily constituting a fatal quantity. The result, however, was the same as before.

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* Zeitschr. f. Hygiene, vol. 19.

A week later, the intraperitoneal injection was repeated with a still larger dose of the living culture, without altering the result.

After the lapse of other five weeks, during which time the animal appeared perfectly well and gained a good deal in weight, it was again intraperitoneally injected with living culture. Again it showed the same symptoms, namely, illness in the evening of the day of injection, but with complete recovery by the next day.

This animal had, then, been injected intraperitoneally on seven separate occasions; the first injection was made on September 15th, the last on December 10th; on the last two occasions the animal receiving more than double the ordinarily fatal dose of *living* culture.

Six weeks after the seventh injection, that is to say four months and a half since the first injection, the animal was found in perfect health and had gained in weight. It was now killed, its blood collected in a test tube, and the serum allowed to separate.

With this serum the following experiments were made:—

1. A guinea-pig weighing 439 grammes was injected *subcutaneously* with 0·25 c.c. of the serum, and a few minutes later $\frac{1}{8}$ of an agar culture of living bacilli was injected into it intraperitoneally. At the same time a control guinea-pig weighing 512 grammes received intraperitoneally $\frac{1}{8}$ of the same culture. Both animals were very ill in six hours, and were found dead the next morning.

2. A second guinea-pig, having received 0·5 c.c. of the serum, also subcutaneously, was a few minutes afterwards intraperitoneally injected with $\frac{1}{8}$ of the same living agar culture. The animal was very ill in six hours, and was found dead next morning.

3. Other three guinea-pigs, (*a*), (*b*), and (*c*), each weighing between 490 and 520 grammes, were injected *per peritoneum* with 0·25 c.c. of the serum in each instance: guinea-pig (*a*) *immediately afterwards* received, also *per peritoneum*, $\frac{1}{8}$ of a living agar culture of typhoid bacilli; guinea-pig (*b*) in *half an hour*, and guinea-pig (*c*), *one hour* later, were similarly dealt with. A control animal (*d*) of about the same weight (473 grammes) received at the same time (per peritoneum) $\frac{1}{8}$ of the same culture. The result was interesting. All four animals were ill in the evening; the control animal and guinea-pig (*c*) were found dead next morning, while guinea-pigs (*a*) and (*b*) were fairly lively, and 48 hours later were quite normal.

4. In order to ascertain whether this result was uniform, I repeated the experiment in precisely the same manner. One control guinea-pig and three that had each received 0·25 c.c. of serum *intraperitoneally*—at intervals respectively of a *few minutes*, *half an hour*, and *one hour* previously—were severally injected, per peritoneum, with an ordinarily fatal dose of living typhoid bacilli. As before, the control animal and that which received the dose of living typhoid bacilli *one hour* after the serum injection were found dead the next morning; the other two guinea-pigs survived.

From these experiments it follows, then, that the blood serum of a guinea-pig which has been subjected to repeated and efficient intraperitoneal injections with living typhoid bacilli does not exert, when *subcutaneously* injected into other guinea-pigs, any general protecting action against subsequent intraperitoneal injection of these animals with an ordinarily fatal dose of living typhoid bacilli. It is only when injected *into the peritoneum itself* that this serum has a protective action, and then only if the interval between the injection of the serum and of the living bacillus has not exceeded an hour. This experience is similar to that of Pfeiffer,* who has shown that the blood serum of a guinea-pig satisfactorily immunised against a fatal intraperitoneal dose of living cholera vibrios possesses a marked germicidal action against living cholera vibrios when both are injected into the peritoneal cavity of other guinea-pigs, but does so only when injected, along with, or immediately before the microbe, in definite quantities proportionate to the dose of living cholera vibrios.

Pfeiffer has also shown, by examining at short intervals of time the peritoneal fluid of such an experimental guinea-pig, that in 15–20 minutes the injected cholera vibrios begin to undergo degeneration owing to the germicidal action of the serum, and that this germicidal action of the serum takes place only within the peritoneal cavity, not outside it in the rest of the animal's body. Similarly, I have in two instances examined the peritoneal fluid of guinea-pigs, which after receiving, per peritoneum, 0·25 c.c. of blood serum derived from "typhoid-prepared" guinea-pigs, were immediately injected, also per peritoneum, with a fatal dose of living typhoid bacilli. With a capillary pipette introduced carefully into the peritoneal cavity, in the one case half an hour and in the other a whole hour after injection of the living culture, a drop of peritoneal fluid was withdrawn, which failed in each case, on cultivation, to produce any colonies. Considering the enormous number of bacilli injected (one c.c. of a strongly turbid mixture into each animal), it seems very remarkable that no living bacilli could be obtained from a drop of the peritoneal fluid; such a result may, however, well be due to a germicidal action of the serum of the "typhoid-prepared" guinea-pigs on the living typhoid bacilli introduced there. In spite, however, of the destruction of the living bacilli the guinea-pig does become temporarily ill (*i.e.*, it is quiet and does not feed) during the evening of the day of injection; but this is no doubt due to a mild poisoning of the animal by the dead protoplasm of the bacilli that have been destroyed within the peritoneal cavity by the blood serum that had been previously injected. In just the same way a guinea-pig may be temporarily poisoned by being injected with one-sixth of the *sterilised* scrapings from an agar culture of the typhoid bacillus. This subject I have dealt with in a former report† drawing attention to the difference in quantity of dead and of living typhoid bacilli required to produce fatal illness in guinea-pigs, and I gave reasons for the observed greater virulence of the *living* microbe when thus injected intraperitoneally.

It now remains to be shown that it is a germicidal action of the serum that caused the destruction of the typhoid bacillus in my experiments.

Issaeff‡ has made a number of experiments on the guinea-pig, tending to show that previous intraperitoneal injection of various other fluids, such as salt solution and normal blood serum, may produce temporary immunity against the cholera vibrio injected intraperitoneally. I have made several experiments on the guinea-pig to see if the same be true with the typhoid bacillus. Thus:—I injected one cubic centimetre of normal salt solution, one cubic centimetre of blood serum of a normal guinea-pig, one cubic centimetre of horse's blood serum (diphtheria anti-toxic serum), respectively, into the peritoneums of three guinea-pigs; afterwards further injecting each of them, and also a "control" guinea-pig, intraperitoneally, with ⅙ of an agar culture of living typhoid bacilli. The result was in all four cases the same, viz., illness in the evening, and death before 24 hours were over. Wherefore I conclude that it is some specific action of the serum of the guinea-pig inoculated against typhoid, that kills the typhoid bacillus.

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* Zeitschrift f. Hygiene, vol. 19, p. 75.

† Report of Medical Officer Local Government Board, 1892–93, pp. 367–384.

‡ Zeitschrift f. Hygiene und Infect., vol. 16, p. 287.

(b.) *Experiments with Calf Serum.*

Having completed these preliminary experiments, I proceeded to inoculate calves with cultures of typhoid bacillus.

Two female calves, Nos. 1 and 2, in good condition and about 2 to 3 months old, were injected subcutaneously each in the groin on October 19th. No. 1 received ⅓, No. 2, ⅔, of an active *agar* culture of the microbe; the growth having been scraped off from the surface of the agar and distributed in sterile salt solution. Next day both calves had slight diffuse swelling at the seat of inoculation, greater in No. 2 than in No. 1, and their temperature had risen; but they fed well and were quite lively. On the 4th day after inoculation, the swelling was well marked in both calves, but their temperature had fallen again. They remained in this condition during the 5th, 6th, and 7th days. On the 8th day the diffuse swelling of the cellular tissue about the lymph glands began to disappear, so that on the 9th day the glands nearest the skin could easily be distinguished by their enlargement; and this was even more marked on the 10th day, the animals continuing to feed well and still having their temperature normal. On the 12th day the swollen glands, though still distinct, began to diminish in size, and by the 18th day nothing abnormal could be distinguished.

A week later, on November 13th, the calves being still quite normal, they were again injected subcutaneously, but in the other groin, this time with a *broth* culture of the typhoid bacillus that had been incubated at 37° C. for 24 hours. Calf No. 1 received 2 c.c., No. 2 3 c.c. of the culture. The next day the temperature of both calves had risen, and each had at the seat of inoculation a large diffuse swelling. On November 15th, the swelling was somewhat smaller in both animals, but the temperature of No. 1 was still above normal; both were feeding well. The swelling became less diffuse during the following days, and in consequence left the glands well defined. By the ninth day after injection, scarcely any swelling was to be distinguished in either calf.

On December 7th, *i.e.*, 48 days after first injection, both calves were injected subcutaneously for a third time in the groin, with *broth* culture of the same sort and in the same quantity as before, and with the same result as on the occasion of the second injection.

On December 31st both calves were injected a fourth time, with an *agar* culture of the typhoid bacillus which had been incubated for 48 hours at 37° C. Each animal received the scrapings from a whole culture tube.

On January 15th both calves were injected for the fifth time, each animal again receiving a whole *agar* culture incubated for two days at 37° C.

On February 13th both calves were injected for the sixth time, each animal receiving 6 c.c. of *broth* culture of the typhoid bacillus incubated for four days at 37° C.

On March 5th both calves were injected for the seventh time, as before subcutaneously in groin, each animal receiving 12 c.c. of *broth* culture of the typhoid bacillus that had been incubated for four days at 37° C.

On March 27th both calves were injected for the eighth time, each animal again receiving 12 c.c. of *broth* culture of the bacillus incubated for four days at 37° C.

On April 10th both calves were injected for the ninth time with the same dose of *broth* culture.

On May 10th both calves were injected for the tenth time, and again with the same dose of *broth* culture.

After each of these injections there occurred, as at first, marked swelling in each animal, lasting for a few days. The rise of temperature was more definite in calf No. 1 than in calf No. 2, though even No. 1 did not show any decided rise of temperature after the ninth injection.

The following experiments were made during this time with the *blood-serum* of calf No. 1 :—

Blood serum A.—On February 7th, *i.e.*, 23 days after the fifth injection, a small quantity of blood was taken from the ear vein of calf No. 1, and allowed to clot, and the serum was then used for the following experiments :—

(*a.*) A guinea-pig, about 420 grammes in weight, was injected *subcutaneously* with 0·5 c.c. of this serum, and immediately afterwards was injected per peritoneum with $\frac{1}{6}$ of an agar culture of the typhoid bacillus.

(*b.*) A second guinea-pig, about 410 grammes in weight, received 0·25 c.c. of the serum *per peritoneum ;* and then as before, also per peritoneum, $\frac{1}{6}$ of a living agar culture of the typhoid bacillus.

(*c.*) A third (and control) guinea pig, 512 grammes in weight, received only one-sixth of the same living agar culture, like the prepared animals, per peritoneum.

All three animals were ill on the evening of the day of experiment, the control animal to a greater degree than the others. The control animal (*c*) was found dead the next morning, *i.e.*, within 20 hours of being injected ; the other two animals were at that time fairly lively, and by the following day guinea pig (*b*) appeared to have quite recovered its normal condition. Guinea-pig (*a*), however, was found dead on the evening of the third day.

Blood serum B.—On March 21st, *i.e.*, 16 days after the seventh injection, a small quantity of blood was again taken from calf No. 1, and with the serum derived from it the following experiments were made :—

(*a.*) A guinea-pig weighing 430 grammes ; and

(*b.*) A second guinea-pig weighing 436 grammes, received each 0·25 c.c. of the serum *per peritoneum.*

Immediately afterwards each received, also intraperitoneally, one-sixth of a living agar culture of the typhoid bacillus.

(*c.*) A third guinea-pig, weighing 570 grammes, made to serve as a control animal, received one-sixth of the same living agar culture per peritoneum.

The control guinea-pig was very ill the same evening, but the other two guinea-pigs were only very slightly affected, appearing only a little less lively than usual. Next morning the control animal was found dead ; the other two were still fairly lively, and on the following day were quite normal.

From these experiments it would appear that the blood serum of calf No. 1 possessed, as early as after the fifth injection of the animal, decided germicidal action, in that 0·25 c.c. of it injected intraperitoneally was capable of protecting a guinea pig against intraperitoneal administration of an otherwise fatal dose of living typhoid bacilli. The serum taken after the seventh injection of this calf was equally powerful in its action, since 0·25 c.c. injected per peritoneum into the guinea-pig was sufficient to prevent the animal from having anything but a very slight indisposition after injection, likewise intraperitoneally, of living typhoid bacilli.

Blood serum C.—On May 2nd, *i.e.*, 22 days after the ninth injection, a small quantity of blood was again taken from calf No. 1, and with the serum derived from it the following experiments were made:—

(*a.*) A control guinea-pig, weighing 797 grammes, was injected *per peritoneum*, with one-sixth of an agar culture of the typhoid bacillus. It died in 20 hours.

(*b.*) A second guinea-pig, weighing 360 grammes, received 0·25 c.c. of serum *subcutaneously*.

(*c.*) A third guinea-pig, weighing 336 grammes, received 0·5 c.c. of serum *subcutaneously*.

(*d.*) A fourth guinea pig, weighing 620 grammes, received 0·125 c.c. of serum *intraperitoneally*.

(*e.*) A fifth guinea-pig, weighing 500 grammes, received 0·25 c.c. of serum *intraperitoneally*.

Half an hour later each of the guinea-pigs (*b*), (*c*), (*d*), and (*e*) received *per peritoneum* what was shown to be a fatal dose of living agar culture of the typhoid bacillus; with the result that they were all quiet that evening: and that next morning guinea-pig (*b*) was found dead, (*c*) and (*d*) were still quiet, while (*e*) was lively and normal. Forty-eight hours afterwards guinea-pigs (*c*), (*d*), and (*e*) were apparently quite well; but guinea-pig (*e*) died suddenly on the evening of the fifth day after injection from some cause which could not be ascertained.

Hence 0·5 c.c. of the serum prepared from the calf in the way above described, was capable when injected *subcutaneously* into the guinea-pig of neutralising an otherwise fatal dose of living typhoid bacilli intraperitoneally administered half an hour later; while 0·125 and 0·25 c.c. of the serum injected *intraperitoneally* sufficed to prevent the fatal effect of the same dose of these bacilli administered in the same way and half an hour later than the serum.

In order to determine more accurately what was the influence of the interval of time between injection of serum and injection of typhoid bacillus upon the result as regards protection conferred, the following experiments were made:—

Blood serum D.—Blood was again taken from calf No. 1 on May 9th, *i.e.*, 29 days after the ninth injection, and the following experiments were made with the serum derived from it:—

(*a.*) Two guinea-pigs were each injected *subcutaneously* with 0·5 c.c. of the serum, and each a few minutes afterwards was injected *per peritoneum* with $\frac{1}{8}$ of an agar culture of typhoid bacillus.

(*b.*) Other two guinea-pigs were each injected *per peritoneum* with a mixture of 0·25 c.c. of the serum and of $\frac{1}{8}$ of an agar culture of typhoid bacillus.

All four animals were ill on the evening of the day of experiment, but next day all seemed to have recovered. No conclusion can, however, be drawn from this series of experiments since a control guinea-pig, weighing 150 grammes more than any of the others, injected *intraperitoneally* at the same time with ⅛ of the same agar culture, although also ill in the evening, was better next evening, and did not die.

The experiment was therefore repeated in a modified form :—

(*a.*) Two guinea-pigs were each injected *subcutaneously* with 0·5 c.c. of the serum of calf No. 1, and half an hour afterwards were injected *per peritoneum* with ⅛ of an agar culture of typhoid bacillus.

(*b.*) Other two guinea-pigs were each injected *per peritoneum* with a mixture of 0·25 c.c. of the serum and of ⅛ of the agar culture typhoid bacillus.

(*c.*) A fifth (control) guinea-pig of about the same size as the others was injected *intraperitoneally* with ⅛ of the agar-culture of typhoid bacillus only.

The control guinea-pig (*c*) was dead on the morning of the following day, at which time both of the animals (*a*) were found quiet and off their food. One of them died on the sixth day, greatly emaciated, and with congestion of the peritoneum; the other had seemingly recovered on the third day.

Of the two guinea-pigs (*b*), both were ill the day following the experiment; one was found dead on the third day, but the other had seemingly by that time recovered.

It is obviously impossible to draw definite conclusions from these experiments, seeing that their number was not sufficiently large. They all, however, show that the injection of 0·25 c.c. of the serum *per peritoneum* shortly before similar administration of the fatal dose of typhoid culture tends to prevent the fatal result which would otherwise ensue.

No. 2.

On the Behaviour of the Typhoid Bacillus and of Koch's Vibrio in Sewage; by Dr. Klein, F.R.S.

App. B. No. 2.

On the Behaviour of the Bacillus of Enteric Fever and of Koch's Vibrio in Sewage; by Dr. Klein.

It has long been an axiom that the use for drinking purposes of water recently polluted by sewage is, on account of the possible presence in it of the typhoid bacillus, to be by all means avoided. For it has been repeatedly proved, both in this country and on the Continent, that typhoid fever is liable to be disseminated by sewage-polluted drinking water. Recently, however, the view thus generally accepted has seemed to be called in question. During 1893–94, Dr. F. W. Andrewes made a number of observations in my laboratory on the behaviour of the typhoid bacillus and bacillus coli in sewage, which observations, along with others by Mr. J. Parry Lawes, have been embodied by these observers in a report to the London County Council. They found that the typhoid bacillus kept in ordinary fluid sewage has not only no tendency to multiply, but, on the contrary, diminishes in numbers and ultimately dies. And on the other hand they found that bacillus coli retains for a long time in sewage its vitality and its power of self-multiplication. These results, as regards the deleterious effect of fluid sewage on the typhoid bacillus—and they are confirmed, as will presently be seen, by my own observation on the behaviour of this microbe in sterile sewage—seem at first sight hardly consistent with serious danger from the use for drinking purposes of water that has been subjected to pollution by sewage. But it has to be borne in mind that the vitality of the typhoid bacillus in sewage may not be parallel to its vitality in sewage *plus* water of one and another sort. For instance, it is established by actual experiment that the presence in an artificial culture medium of certain earthy salts materially enhances the vitality therein of the typhoid bacillus, and at the same time favours its life processes: so that the chemical constituents of a drinking water to which sewage gains access may have important influence as regards the risk incurred by the consumers of such water. Further, there is the fact that *direct* pollution by sewage containing the typhoid bacillus is not the only—perhaps is not the most dangerous—method by which a water supply can acquire ability to disseminate enteric fever. The fluid contents of cesspools, for instance, that have percolated through the soil, have again and again been convicted of conveying to the water stratum furnishing underground water supplies, the material of enteric fever. In such case it is probable that the typhoid bacillus, after escape from the cesspool, has been arrested for a time in the soil through which it was percolating; has there found opportunity and pabulum for increasing in number and in activity; and has later on—at time of heavy rainfall—been suddenly washed out in abundance from the soil, only to pass at once into the water stratum to which the cesspool fluids in ordinary course more slowly gravitated.

In view of these considerations I have sought to ascertain in regard of fluid sewage, how far addition thereto of *nitrates*—as representing for experimental purposes salts to be found alike in sewage-polluted drinking water and in soil through which sewage matters percolate—tends to modify this medium as a multiplying ground for certain microbes.

Crude sewage, such as passes into the drains of St. Bartholomew's Hospital, was taken prior to addition to it of the customary disinfectant, and was found to be neutral in reaction. It was first filtered through a Berkefeld filter, in order to remove, as much as possible, the microbes originally contained in it. The filtrate was then placed in four sterile flasks, each of which received 100 c.c. To each of two of the four flasks potassium nitrate was added to the amount of 1 per cent. The other two flasks received none of the salt. All four flasks were now exposed to 70° C. for 15 minutes, in order to sterilize their fluid contents. No visible change occurred; the fluid remained clear, and there was no deposit on cooling. The next proceeding was to inoculate the flasks, one sewage-flask and one sewage-*plus*-nitrate flask in each instance, with material from recently prepared pure cultures (on agar) of the typhoid bacillus and of Koch's cholera vibrio; care being taken always to distribute the inoculating material uniformly* throughout the fluid before testing the number of microbes present in each flask at this initiatory stage. Plate cultivations were then made with 0·01 c.c. of the contents of each flask, and gave the following results:—

Typhoid bacilli in pure sewage, about 25,000 per 1 c.c.
Typhoid bacilli in nitrate sewage, about 20,000 per 1 c.c.
Cholera vibrios in pure sewage, about 32,000 per 1 c.c.
Cholera vibrios in nitrate sewage, about 32,000 per 1 c.c.

The flasks were now placed in the cupboard of the laboratory and kept there at ordinary temperature. Three days later, and still more markedly in seven days, it was found on inspection that the "nitrate sewage flasks" were conspicuously more turbid than the "pure sewage flasks," and that this difference was most striking in regard of the "nitrate sewage" inoculated with the cholera vibrio. This, of course, indicated that the microbes had multiplied especially in the "nitrate sewage," a fact that was further illustrated by making gelatine plate cultivations with 0·01 c.c. of the fluid from each of the four flasks. In the gelatine plates inoculated with the "nitrate sewage," the colonies were so densely crowded that it was impossible to count them, whereas the colonies in gelatine plates inoculated with the "pure sewage" were far from crowded, and could be easily counted.

After lapse of another two days, *i.e.*, nine days from the commencement of the experiment, further plate cultivations were instituted, a much smaller quantity (by dilution) being used in each instance in order to be able to count more accurately. From the typhoid flasks 0·00025 of a c.c. was taken for each plate, from the cholera flasks 0·00010 of a c.c. The result was this:—

Typhoid bacilli in pure sewage, 185 colonies per plate.
Typhoid bacilli in nitrate sewage, 1,568 colonies per plate.
Cholera vibrios in pure sewage, about 3,936 colonies per plate.
Cholera vibrios in nitrate sewage, 2,100 colonies per plate.

Fifteen days from the commencement of experiment, the flasks were tested again, 0·001 c.c. being used for each plate, and the result was as follows:—

Typhoid bacilli in pure sewage, 15 colonies per plate.
Typhoid bacilli in nitrate sewage, 2,400 colonies per plate.
Cholera vibrios in pure sewage, about 6,000 colonies per plate.
Cholera vibrios in nitrate sewage, about 2,000 colonies per plate.

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* The culture material of experiment was distributed in a c.c. of sterile salt solution, and, of this, 3 drops were added to each flask.

On the 24th day they were again tested, 0·001 c.c. again being used for each plate, with result as follows:—

Typhoid bacilli in pure sewage, 6 colonies per plate.
Typhoid bacilli in nitrate sewage, over 1,500 colonies per plate.
Cholera vibrios in pure sewage, about 2,000 colonies per plate.
Cholera vibrios in nitrate sewage, 1,000 colonies per plate.

From these experiments it appears that the typhoid bacillus shows incomparably greater vitality in "nitrate sewage" than in "pure sewage"; in the latter the typhoid bacillus does not multiply but decreases, whereas in the former it distinctly increases in number. As to the cholera vibrio, it appears to prefer "pure sewage" to "nitrate sewage."

In order to see whether results of the above sort are uniformly obtainable, the experiments were repeated at a later date. Crude sewage was again obtained from St. Bartholomew's Hospital drains, and was filtered through a Berkefeld filter into 4 sterile flasks, each of which was made to contain 100 c.c.

As before, 1 per cent. potassium nitrate was added to two of the four flasks, and all four were exposed to 70° C. for 15 minutes in order to sterilize their contents. No visible change in the aspect of the fluids was produced by this heating, they remained clear and showed no precipitate. That the contents of the flasks had become really sterile was proved by plate cultivations. Inoculation of the flasks with typhoid bacilli and with cholera vibrios was made exactly as in the previous experiments, and plate cultivations were then made, in each instance, with 0·01 c.c. of the fluid. The result was:—

Typhoid bacilli in pure sewage, 273,600 colonies per 1 c.c.
Typhoid bacilli in nitrate sewage, 465,600 colonies per 1 c.c.
Cholera vibrios in pure sewage, 267,200 colonies per 1 c.c.
Cholera vibrios in nitrate sewage, 291,200 colonies per 1 c.c.

After lapse of eight days, the fluids in the flasks were tested again in plate cultivation, with result as follows:—

Typhoid bacilli in pure sewage, 800,000 colonies per 1 c.c.
Typhoid bacilli in nitrate sewage, 3,200,000 colonies per 1 c.c.
Cholera vibrios in pure sewage, 556,800 colonies per 1 c.c.
Cholera vibrios in nitrate sewage, 1,670,400 colonies per 1 c.c.

Tested again, on the 25th day, the plates showed:—

Typhoid bacilli in pure sewage, 28,400 colonies per 1 c.c.
Typhoid bacilli in nitrate sewage, uncountable.
Cholera vibrios in pure sewage, no colonies.
Cholera vibrios in nitrate sewage, over 700,000 colonies per 1 c.c.

After lapse of eight weeks the flasks were tested again in plate cultivation, with results as follows:—

Typhoid bacilli in pure sewage, 16,640 colonies per 1 c.c.
Typhoid bacilli in nitrate sewage, 1,664,000 colonies per 1 c.c.
Cholera vibrios in pure sewage, no colonies.
Cholera vibrios in nitrate sewage, 76,000 colonies per 1 c.c.

As to the typhoid bacillus, the result of this series of experiments was in accord with the first series. The micro-organism multiplied readily in "nitrate sewage," and for eight days in "pure sewage" also; but in this medium it began then markedly to decrease. But the result with the cholera vibrios was different in this series as compared with the first. This vibrio disappeared from "pure sewage," while still maintaining itself with vigour in the "nitrate sewage."

The colonies of the cholera vibrio, as they appeared in the last plates of this series made with the cholera-infected "pure sewage" and "nitrate sewage," were in some respects different from the colonies of the cholera vibrio originally introduced into the flasks. The differences were:—(*a*) that the liquefaction of the gelatine was very markedly retarded; (*b*) that most of the colonies appearing in the plates had an air bubble attached to them; and (*c*) that the microbes of the colonies were made up to a very large extent of spirals which in stained preparations were uniformly jointed. Sub-cultures made from these colonies in peptone salt solution yielded, however, typical growth, and the peptone cultures gave very fair cholera-red reaction. Subcultures in gelatine (stab-culture) and on agar yielded also typical growths.

Similarly a change occurred in the typhoid bacillus when growing, whether in "pure sewage" or in "nitrate sewage." This consisted in the fact that the surface colonies in the gelatine plates were never the characteristic placoids found in normal plate cultures of the bacillus: they remained minute flat dots. Transferred, however, to the surface of nutrient gelatine, the plate-like expansions of the colonies on the surface of the gelatine characteristic of the typhoid bacillus reappeared in the course of two or three subcultures.

With a view of testing, broadly on the above lines, the reputed different ability of bacillus coli and the typhoid bacillus to maintain their existence in sewage, certain subsidiary experiments were instituted, as follows:—

Two flasks, each containing 100 c.c. of sterile sewage, were inoculated with material from cultures respectively of typhoid bacillus and bacillus coli. This having been done, a platinum loop-full of sewage from each flask was rubbed over the slanting surfaces (measuring 6 × 2 centimetres) of gelatine in separate test tubes; and with the result that in both tubes the colonies that appeared were practically uncountable.

Seven days later, the two flasks being again tested by the same method, the colonies appearing in the bacillus coli test tube were still uncountable, whereas those appearing in the typhoid bacillus test tube numbered 46 only.

At the end of *three weeks*, a sample from the bacillus coli sewage flask still yielded on culture innumerable colonies, whereas a sample from the flask inoculated with the typhoid bacillus only yielded 12 colonies.

No. 3.

On the Abilities of certain Pathogenic Microbes to maintain their Existence in Water; by Dr. Klein, F.R.S.

On the Abilities of certain Pathogenic Microbes to maintain their Existence in Water; by Dr. Klein.

Not a few laboratory observations have, in recent years, been recorded tending to foster belief that certain pathogenic bacteria can subsist for a short while only when they have become mingled with large volumes of water. But on the other hand there is the fact—again and again demonstrated in this and other countries—that not only have public water supplies disseminated diseases such as enteric fever and cholera, but that they have disseminated these diseases under circumstances which demand that the particulate cause of the one or the other malady should have persisted for days and weeks in the water, if indeed it had not multiplied itself there. Question has, therefore, been seen to be arising whether the vitality of a given micro-organism may not be better conserved in some waters than in others; whether, indeed, a particular water may not foster a given micro-organism while it is hostile to other and dissimilar microbes. So it was determined that study should be made of the abilities, severally, of different microbes to maintain themselves, and to multiply, in water of one and another sort.

In previous records of observations as to the ability of particular microbes to subsist in water, the evidence adduced is based upon experimental procedures that to my mind are open to objection. All observers, with the exception of Hoeber as regards cholera vibrios,* examine now and again, by culture, *a small amount* only (1 cubic centimetre or a fraction thereof) of the water in question, by way of testing, as time goes on, the persistence or the disappearance of the bacteria introduced. And as soon as the small amount of the water that it is customary to test ceases to yield colonies, the microbe is put down as having disappeared from the total water; as having, in fact, become devitalised. Now such a conclusion is by no means always justified. Take, for instance, the observations recorded by Prof. Percy Frankland† on the vitality of the typhoid bacillus in various waters. This observer inoculated his series of cultures with *drops* only of the water to be tested (rarely did he submit at one and the same time more than one cubic centimetre of a given sample to the culture test); and though his observations show to what degree the number of the typhoid bacilli introduced by him into various waters decreased, they are not to be relied on as showing whether and when they disappeared altogether; for, obviously, unless—and this was not done—the total quantity of the experimental water be subjected to examination no conclusion as to total devitalisation can be drawn. And it is the total disappearance from the water of the typhoid bacilli which is the question of practical importance. In illustration of the need for caution in this sense, I would cite certain facts respecting the outbreak of typhoid fever in Worthing in 1893 investigated by Dr. Theodore Thomson, record of which appears in the Report of the Medical Officer for 1892–93. The water that was distributed to the public in Worthing was in part taken from a well which was proved to have been open to contamination from sewage-polluted soil; and this water, when I used, in examining it by the culture test, the particulate matter of so large a volume as 1,200 c.c. yielded only a limited number of colonies of the typhoid bacillus amongst more numerous colonies of bacillus coli. Had only 10 to 50 cubic centimetres been used for my cultivations, no colonies of typhoid need have been found; these bacilli were, indeed, so sparsely found by me in the water that not more than a single bacillus could be assigned to each 200 c.c. of the water. So, too, in 1893, in reference to polluted well water in Rotherham. Here a limited number only of typhoid bacilli (amongst a crowd of bacillus coli) were detected in several hundreds of cubic centimetres of the water.

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* Centralbl. für Bakteriol and Parasit, April 16, 1895, p. 443.

† Papers by Prof. Percy Frankland in the Proceedings of the Royal Society, vol. 56, N. 338, and in Zeitschr. f. Hygiene and Infektionskr, April 1895.

The various statements, then, that have been made as to the more or less rapid and complete disappearance from a water of the typhoid bacilli or of the cholera vibrios introduced into it, cannot be accepted as supported by adequate evidence. Statements to that effect based on examination of a few drops of the suspected water are valid no doubt, in so far as they refer to diminution in number of the microbes; but they fail to decide the practical and important question whether at a particular time in a given water to which typhoid or cholera dejecta had access, the typhoid bacilli or the cholera vibrios respectively, have or have not disappeared.

Further, there is the consideration that the laboratory experiments hitherto recorded by various observers, and held to be indicative of not long sustained vitality of typhoid bacilli and of cholera vibrios in water, are not trustworthy for the reason that the microbes introduced into the water samples by no means certainly carried with them some of the nutritive material of the cultures whence they were derived. And under natural conditions, be it remembered, typhoid bacilli or cholera microbes getting access to water supplies are intermingled with intestinal dejecta which are to be thought of as affording pabulum favouring their persistence, if not their multiplication, in the water.

That the diminution, however great, of the number of microbes in a water, need not, and as a matter of fact (as my experiments will show) does not, imply their total disappearance, must be obvious from the following consideration. If a fairly large number of microbes be introduced into a given volume of sterile non-nutritive water, and a great diminution of them occurs in the course of time, a corresponding amount of pabulum in the water will, in the form of dead bacilli, become available on which the limited number of remaining bacilli can subsist; indeed the smaller the number of the remaining bacilli the better their chance of living and multiplying. These in turn dying off will afford food for a small number of their offspring and so on; so that some few will for a long time remain present. Prof. Frankland himself regards something of this sort as indicated by some of his experiments on the vitality of bacilli in water. He clearly shows that typhoid bacilli can be acclimatised to water, and he infers, as I think correctly, that a small amount of nutritive material derived from dead bacilli will at any rate suffice to support for a considerable time some of the surviving microbes.

As a preliminary to my own investigation of this subject, I instituted a series of experiments with distilled, chemically pure, water. Although this series does not throw light on the practical question of the vitality of microbes in water, it is nevertheless of value as supplying a standard whereby the behaviour of one and another microbe in other and "natural" waters may be judged.

In this series as in all other experiments to be described in this report, sterile flasks received each 100 c.c. of the water to be tested. As regards the microbe of experiment, it was scraped with a platinum-wire loop from the surface of the solid medium on which it had been growing, and was distributed in a few cubic centimetres of sterile distilled water. Of this mixture, a small amount, ranging from a few drops to 0·5 c.c., was introduced into the 100 c.c. of the water in the flask, which was then plugged with sterile cotton wool. In scraping the microbic growth from the surface of the solid medium, care was taken to avoid scraping off culture material also; so that the water should receive practically the microbe only, without any of the medium in which it had grown. It is true that traces of the medium must have been introduced into the sterile distilled water in which the microbe was at first distributed; but considering the relatively small amount of growth scraped off the medium and the relatively large bulk of water in which it became ultimately distributed, the amount of culture medium introduced into the experimental flask could have been only infinitesimal. Care in this sense was necessary, since, as has been already pointed out, the introduction of culture medium (*i.e.*, of nutritive material) into the water of experiment may materially alter the result. It stands to reason, indeed, that the vitality of highly specialised microbes, such as the typhoid bacillus, bacillus coli, and the cholera vibrio, accustomed as they are to rich and nitrogenous pabulum, would be greatly encouraged by the presence of material of this sort in the water.

After introducing the mixture of distilled water and microbic growth into the flask, the latter was well shaken so as to distribute the material in the water as uniformly as possible. The transparency of the water was by this process but very slightly affected; only on comparing such a water with one not thus dealt with could a slight diminution of transparency be detected. All the flasks were kept in a dark closet at the temperature of the laboratory.

Immediately after the addition of the microbes to the water sample, plate cultivations were made in order to ascertain their number at this stage, so that their subsequent diminution could be duly checked.

Series 1.—Typhoid Bacillus and Koch's Cholera Vibrio in Sterile Distilled Water.

The cultures in this series, as indeed in all my experiments, were agar cultures of recent date,* grown for 48 hours at 37° C. The typhoid bacilli were originally derived from the spleen of a fatal case of typhoid fever. The cholera vibrios were derived from the rice water contents of the ileum of a typical fatal case of cholera that occurred during the Ashbourne outbreak in 1893, which has been described in the Report of the Medical Officer of the Local Government Board, on "Cholera in England in 1893."

The distilled water was ordinary commercial distilled water. Of this 100 c.c. were placed in a sterile flask, boiled therein a few minutes, and then cooled; after which the microbic mixture was added as above stated.

1. *Typhoid bacillus in distilled water.*—On July 10th plate cultivations made from the water in the flask immediately after addition of the

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* Recent and actively growing cultures were invariably used, in order to deal with vigorous microbes. Old cultures ought to be avoided, since many of the bacilli may be, and as a matter of fact are, weakened and consequently less resistant.

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On the Abilities of certain Pathogenic Microbes to maintain their Existence in Water; by Dr. Klein.

microbe, showed that it contained 1,536 colonies of typhoid bacillus per cubic centimetre.

On July 13th *i.e.*, three days later, further plate cultivations were made, using a whole cubic centimetre of the water for each plate. Result, no colonies of the typhoid bacillus.

On July 21st, the same test was repeated; no colonies.

On August 1st, there was added to the remainder of the water in the flask, 100 c.c. of sterile faintly alkaline broth, and the mixture was incubated at 37° C. After 48 hours incubation the fluid was limpid; no growth was present. Plate cultivations made severally with 1 c.c. of this mixture of water and broth produced no colonies.

From this it appears that, in the particular instance, after lapse of so short a time as three days, no living bacilli were found in 1 c.c. of the experimental water; and that after lapse of twenty-one days no living bacilli were present in the whole of the 100 c.c. of sterilised distilled water originally infected.

Certain considerations have however to be borne in mind in comparing this experiment with others presently to be described. For instance, the number of bacilli introduced into the distilled water was small, namely, not more than 1,536 per 1 c.c.; the amount of nutritive material present was practically nil; and the sub-culture of typhoid bacillus used was but two removes from an original culture inoculated with material from the spleen of a case of typhoid fever. Some of these conditions might, as will be seen from the following experiments, have materially affected the result. Thus:—

An agar culture of the typhoid bacillus was selected, corresponding in all respects to that used in the first experiment, save that the medium (set with slanting surface) was more recently prepared, and that the test tube containing it held (as usual in such case) a considerable amount of condensation fluid in its lower part. Consequently, after this agar tube had been inoculated with the typhoid bacillus, and incubated for 24 hours at 37° C., the fluid at its base was turbid and filled with typhoid bacilli. Of this fluid about ten drops were introduced (as before) into 100 c.c. of sterile distilled water, and, plate cultivations having been at once made, the number of colonies of typhoid bacilli present per c.c. of this water was ascertained to be about 2,100.

After the flask had been kept in the dark closet for three days, plate cultivations were again made and the number of colonies of typhoid bacilli was made out to have increased to about 20,000 per cubic centimetre.

After 7 days the number was about 12,000 per cubic centimetre.
„ 14 „ „ „ „ 6,000 „ „ „
„ 3 weeks „ „ „ 1,000 „ „ „
„ 6 „ one cubic centimetre of the water added to a gelatine plate yielded 400 colonies.

After two months, only about 70 colonies were obtained from 1 c.c. of the water in the flask.

After three months (no colonies being now obtainable from 1 c.c. of the water added to the gelatine and poured out in a plate), an amount of nutritive beef broth equal in volume to the total water remaining in the flask was added thereto, and the flask placed in the incubator at 37° C. for 24 hours. As a result, the broth became strongly turbid, and, on making plate cultivation with a fraction of a droplet, innumerable colonies of typhoid bacillus (as tested in the various media—agar, gelatine as shake-culture, potato, milk, and broth) were obtained.

The difference then between the results of the first and second experiments was very striking indeed: in the latter, where an appreciable amount of nutritive material was introduced into the distilled water along with the typhoid bacilli, some of these microbes persisted over three months, notwithstanding that their number markedly diminished after the first week.

Another experiment shows the effect of introducing a large number of organisms at starting, as follows:—

To a flask containing 100 c.c. of sterile distilled water, there was added bacillus growth from the surface of the agar culture of the typhoid bacillus used in the first experiment, sufficient in amount to render the water distinctly deficient in transparency. Each cubic centimetre of the water, moreover, as shown by plate cultivation, contained at starting over 100,000 colonies of the bacilli. This flask, which remained in the dark closet of the laboratory along with the flask of the first experiment, yielded at the end of four weeks as many as 1,000 colonies per cubic centimetre of its contents. After three months, each cubic centimetre yielded 160 colonies; and even after six months five colonies were obtainable per cubic centimetre. This survival of the bacilli for six months in the sterile distilled water is altogether consistent with the suggestion that the dead protoplasm of a large number of the original bacilli had yielded sufficient nutritive material for enabling a few of the microbes to maintain their existence.

2. *Cholera vibrios in sterile distilled water.*—The number of colonies of the vibrio per cubic centimetre of water in an infected flask was found at the commencement of experiment to be 368.

After lapse of three days, plate cultivation still showed about 300 per cubic centimetre.

After six days, 1 c.c. of the sample added to one gelatine plate yielded about 100 colonies.

After a fortnight, 1 c.c. did not yield any colonies.

At the end of 16 days, an equal bulk (about 96 c.c.) of a 1 per cent. peptone salt solution was added to the whole of the distilled water remaining in the flask, and this mixture was then incubated at 37° C. The contents of the flask remained clear, and plate cultivations made from the superficial portion of the fluid yielded no colonies.

From this it is seen that cholera vibrios when introduced, without nutritive medium, and in small numbers, into sterile distilled water, soon diminish in number and then disappear, though not quite so fast as the typhoid bacilli in like circumstances.

SERIES II.—TYPHOID BACILLI and CHOLERA VIBRIOS in FILTERED LONDON WATER.

Samples of the following waters were taken for experimental purposes:—

(*a.*) West Middlesex (Thames) water as delivered in houses at Earl's Court.

(*b.*) New River water as delivered at St. Bartholomew's Hospital.

(*c.*) Kent Company's water (from wells in the Chalk) as delivered at Hatcham?

These waters were filtered, in each instance, through a sterile Berkefeld filter in order to remove from them, as much as possible, the water-bacteria that they contained. Of each sample thus filtered

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100 c.c. were placed in each of two sterile flasks fitted with sterile cotton-wool plugs. To one of each pair of flasks there was added material from a recent culture of typhoid bacilli, to the other material from a culture of cholera vibrios; a few drops of the turbid condensation water from the bottom of the test tube being used for inoculation in each instance. Immediately after the six flasks had been inoculated, plate cultivations were made with a small quantity (0·10 c.c.) of their contents in each instance, so as to ascertain the number of microbes (whether typhoid bacilli or cholera vibrios) per 1 c.c. at this stage. Then, as in the former cases, the six flasks were placed in a dark cupboard in the laboratory.

A.—*Experiments with Typhoid Bacilli.*

Immediately after inoculation of the flasks the waters were tested by means of phenolated gelatine plates in the following manner:—One c.c. of each of them was added to phenolated gelatine (·1 c.c. of a 5 per cent. phenol solution to 10 c.c. of nutrient gelatine) which was dealt with as a plate cultivation:—

(*a.*) West Middlesex water yielded crowds of colonies per cubic centimetre.
(*b.*) New River water also yielded crowds of colonies; on a very rough estimation there must have been something like 660,000 per cubic centimetre.
(*c.*) Kent water yielded 2,500 colonies per cubic centimetre.

Four days after inoculation:—

(*a.*) West Middlesex water yielded crowds of colonies per c.c.
(*b.*) New River ,, ,, ,,
(*c.*) Kent water ,, ,, ,,

Sixteen days after inoculation:—

(*a.*) West Middlesex water still yielded crowds of colonies per c.c.
(*b.*) New River ,, ,, ,,
(*c.*) Kent water yielded about 172,000 colonies per cubic centimetre.

Twenty-one days after inoculation:—

(*a.*) West Middlesex water yielded colonies easily countable; about 24,000 per cubic centimetre.
(*b.*) New River water yielded about 66,800 colonies per cubic centimetre.
(*c.*) Kent water yielded about 100,000 colonies per cubic centimetre.

Five weeks after inoculation:—

(*a.*) West Middlesex water yielded 1,155 colonies per cubic centimetre.
(*b.*) New River water ,, 110 ,, ,,
(*c.*) Kent water ,, 36,000 ,, ,,

Eight weeks after inoculation the waters were tested again by means of phenolated gelatine plates. The result was that—

(*a.*) West Middlesex water now contained about 50 colonies per cubic centimetre.

(*b.*) New River water did not now contain any colonies per cubic centimetre.
(*c.*) Kent water contained about 1,000 colonies per cubic centimetre.

It appears, then, from these experiments, that by adding in the first instance large numbers of typhoid bacilli—always, be it noted, along with a trace of nutritive material—to samples of London waters sterilized by filtration before inoculation, living bacilli were recoverable therefrom, in two out of the three samples, even after the lapse of eight weeks. In no case could the addition of the nutritive material have been other than very small (a few drops only per 100 c.c. of water); nevertheless it may possibly have exerted a powerful influence on the persistence of the bacilli.

The three waters did not, however, behave in exactly the same way. In the Thames (West Middlesex) and Lea (New River) Waters, the bacilli, after apparently remaining stationary in amount during the first 16 days, decreased considerably; whereas those in the Kent water increased in four days, and after 16 days were still in larger numbers than at starting. Not until five weeks after inoculation was decrease of their number pronounced; and even then they were more numerous than at starting.

It is quite clear, therefore, seeing that the same culture of the typhoid bacillus was used for inoculation of all three waters, that the observed difference of effect on the microbe of West Middlesex and New River water on the one hand and of Kent water on the other, must have been due to some intrinsic differences in these waters. And since it has been shown by other observers (Percy Frankland, for instance), that the presence in a water of certain inorganic elements (salt, nitrates, potassium salts) may favour the vitality and multiplication therein of some microbes, it is quite possible that lime salts belong to this group, and that the longer resistance of the typhoid bacillus in Kent (Chalk) water may be thus accounted for.

B.—*Experiments with Cholera Vibrios.*

Immediately after inoculation of the flasks, gelatine plate cultures were made, each with 0·1 c.c. of the water, and with the following result:—

(*a.*) West Middlesex water yielded 4,000 colonies per cubic centimetre.
(*b.*) New River water yielded 120 colonies per cubic centimetre.
(*c.*) Kent water „ 8,000 „ „

Five days after inoculation:—

(*a.*) West Middlesex water yielded colonies so crowded together that it was impossible to count them.
(*b.*) New River water yielded colonies so crowded together that it was impossible to count them.
(*c.*) Kent water yielded colonies so crowded together that it was impossible to count them.

But on careful examination, the colonies in none of the plates looked like those of the cholera vibrio.

After lapse of eight days, the New River water was found to have become distinctly turbid, and in this sense it contrasted markedly with the other two waters. Plate cultures were now made of each of the waters, using a smaller quantity (0·01 c.c.) than before per plate.

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The result was this :—

(*a.*) West Middlesex water yielded 756,000 colonies per cubic centimetre; but the colonies were of yellow brown colour and did not liquefy the gelatine.

(*b.*) New River water also yielded crowds of non-liquefying colonies;

(*c.*) Kent water yielded numerous colonies, 132,000 per cubic centimetre; but they also did not liquefy gelatine, and were not, therefore, cholera vibrios.

There could be no question, therefore, that in all the samples the cholera vibrios had been superseded in the gelatine plates by some other and rapidly growing microbes originally present in the water; micro-organisms that had remained in it after it had passed through the Berkefeld filter and which had since rapidly multiplied. Nevertheless it would not have been justifiable to draw the conclusion that no cholera vibrios remained present in the flasks, and, indeed, direct experiment with peptone solution proved that they still existed there.

Thus :—To about 10 c.c. of a 1 per cent. peptone salt solution contained in each of three test tubes, there was now added 1 c.c. of water from the flasks (*a.*), (*b.*), (*c.*), and these test tubes were then incubated at 37° C. for 24 hours. As a result, the peptone tubes inoculated with New River and with Kent water respectively showed turbidity; and when a platinum-wire-loopful of the surface-fluid in each of these tubes was withdrawn and examined, in the fresh state and by the gelatine plate method, it was ascertained that they contained typical cholera vibrios in pure culture. Moreover, both peptone tubes gave distinct cholera-red reaction. The West Middlesex peptone tube did not show turbidity until after 48 hours incubation, when herein also was found a pure culture of typical cholera vibrios.

This experiment affords a good example of the survival in water of cholera vibrios for as long as eight days, notwithstanding the presence there in abundance of other microbes.

After lapse of 36 *days* from inoculation, all the three waters were again tested by peptone culture, 1 c.c. of each water being added to 10 c.c. of peptone salt solution. The result was that in the case of the Kent and the New River samples the peptone solution was strongly turbid after 24 hours incubation at 37° C. Both were found to contain cholera vibrios in pure culture, and both peptone tubes gave typical cholera-red reaction. The West Middlesex peptone tube was, at this date, only very slightly turbid, and contained but few comma bacilli. These, however, proved typical in subsequent gelatine plate culture. No cholera-red reaction was obtained in this peptone tube after 24 hours, but other peptone tubes inoculated from the above gelatine plate gave good cholera-red reaction.

From these experiments it follows that cholera vibrios survived for more than *five weeks* in these water samples, notwithstanding that within five days of inoculation of the samples they could not, owing to the large number of other microbes, be demonstrated therein by the gelatine plate method. Their survival, in each instance, for several weeks would appear related to the introduction with them into the water samples of a small amount of nutritive material. At the termination of the experiment the cholera vibrios appeared least numerous in the Middlesex water; certainly they were less abundant there than in the other two waters, although the number of vibrios at the beginning of experiment found in the West Middlesex water was some 30 times greater than in the New River water.

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SERIES III.—CHOLERA MICROBES in BOILED LONDON WATERS.

In this series the same waters were used as in series II., viz.:—(*a.*) Middlesex, representing Thames water; (*b.*) New River, representing Lea water; and (*c.*) Kent water, representing water from deep wells in the Chalk. 10 c.c. of each water were placed in sterile test tubes plugged with sterile cotton-wool, the tubes being then boiled for 1–2 minutes, and cooled. In each tube a small amount of whitish sediment appeared during boiling; this settled down on cooling, and remained at the bottom of the tube. The tubes were inoculated, by means of a capillary glass pipette, each with three drops of a cholera culture that had been growing in gelatine for about four weeks at 20° C., the medium having by this time become liquefied sufficiently to admit of the use for this purpose of fluid material densely crowded with actively mobile cholera vibrios. As a result of this inoculation, the water in the tubes became slightly turbid. Immediately after inoculation, and after shaking, gelatine plate cultures were made of the three samples, each plate receiving 0·01 c.c. of the water; and as a result all the waters were found to yield about the same number of colonies of cholera vibrio, viz., 6,600 per plate, which would represent 660,000 per cubic centimetre.

After lapse of nine days, plate cultivations were again made, each with 0·01 c.c. of a water. As a result, (*a.*) West Middlesex water and (*c.*) Kent water showed neither decided increase nor decrease in number of colonies as compared with the previous examination; but in (*b.*) New River water there was distinct diminution, namely only 752 colonies per plate as compared with 6,600 when first tested.

After lapse of a month (31 days), the waters were tested again, double the previous quantity, viz., 0·02 c.c. being used for each plate; and with result as follows—

(*a.*) West Middlesex water, 172 colonies per plate, or 8,600 per cubic centimetre.

(*b.*) New River water, 127 colonies per plate, or 8,350 per cubic centimetre.

(*c.*) Kent water, only slight diminution as compared with previous testing.

After lapse of three months, the samples were tested again, this time by inoculating tubes containing peptone salt solution, each with 0·5 c.c. of the water; the tubes being incubated at 37° C. All the tubes became turbid in 48 hours and were found to contain pure growth of cholera vibrios, as was shown by fresh and stained cover-glass specimens, by gelatine plates made from the surface of the fluid in the peptone tubes, and by the distinct cholera-red reaction of the peptone culture.

Thus, after lapse of *three months* all these three waters contained abundantly the living cholera vibrios. A gradual diminution of the number of vibrios had, it is true, taken place; but this was to be expected, seeing that the water was very poor in nutritive material. Three drops only of liquefied gelatine had been distributed in each 10 c.c. of water, an amount representing — seeing that three drops barely equal one-twentieth of a cubic centimetre—at most one part culture in 200 of water (or less than 0·5 per cent.). There were traces only of "nutritive material" in the culture introduced in the water, yet these traces of nutritive material sufficed to keep cholera vibrios alive therein for three months.

SERIES IV.—TYPHOID BACILLI and CHOLERA VIBRIOS in STERILISED (NOT BOILED) LONDON WATERS.

In Series II. London waters had been used which were passed previously through a Berkefeld filter in order to eliminate as much as possible the water bacteria contained therein. This the process effected to a large extent, but not to the degree of rendering the waters sterile; in all three samples crowds of additional bacteria appeared to the detriment of those that had been intentionally introduced. In order therefore to render the waters at starting really sterile without, however, interfering with their characters, as happens (by sedimentation) when they are boiled, the following plan was adopted:—Each sample was filtered through a sterile Berkefeld filter, and 100 c.c., of the filtrate placed in each of two sterile flasks, which, having been plugged with sterile cotton wool, were exposed for 5–10 minutes to a temperature of 65°–70° C. By this means two samples of each of the three London waters were made absolutely sterile (as was proved by cultivation), without undergoing any visible alteration; no sediment or other change appeared in them, they remained quite clear after cooling.

Three of the flasks (one West Middlesex, one New River, and one Kent water) were now inoculated with the typhoid bacillus; other three with the cholera vibrio. The microbes, in each instance, were taken with a platinum-wire loop direct from the surface of vigorous recently established (48 hours old) agar-cultures; care being taken that, practically, none of the nutritive medium was added to the waters. Immediately after inoculating and shaking the flasks, plate cultivations were made from them, each plate with 0·01 c.c of water. It ought to be added that the waters after inoculation looked only very slightly turbid; rather less limpid, that is, than samples in control flasks.

(A.) *Typhoid Bacilli in London Waters Filtered and Sterilised.*

Samples (0·01 c.c. in each instance, taken from the flasks *immediately* after inoculation with the microbe, showed in:—

(*a.*) West Middlesex water, about 1,000 colonies per plate, or 100,000 per cubic centimetre.

(*b.*) New River water, about 2,000 colonies per plate, or 200,000 per cubic centimetre.

(*c.*) Kent water, about 3,000 colonies per plate, or 300,000 per cubic centimetre.

Eight days after inoculation the flasks were tested again, using this time 0·005 c.c. for each plate:—

(*a.*) West Middlesex water now yielded 3 colonies per plate, or 600 per cubic centimetre.

(*b.*) New River and (*c.*) Kent water yielded about the same number of colonies as before.

Twenty-five days after inoculation:—

(*a.*) West Middlesex water yielded 23,000 colonies per cubic centimetre.

(*b.*) New River water yielded 110,400 colonies per cubic centimetre.

(*c.*) Kent water yielded 960,000 colonies per cubic centimetre.

Forty days after inoculation:—

(*a.*) West Middlesex water yielded 1,300 per cubic centimetre.
(*b.*) New River water „ 96,000 „
(*c.*) Kent water „ 100,000 „

Eighty-five days after inoculation, the waters were tested again, by adding 0·5 c.c. of each to 10 c.c. of phenolised broth, the test tubes containing such mixture being incubated at 37° C. After 48 hours, the phenolised broth to which West Middlesex water had been added remained quite clear, whereas the New River and Kent samples had become turbid. These two, on examination by cover-glass preparations and by sub-culture, were found to contain typhoid bacillus in pure culture.

In order to see whether any typhoid bacilli could be discovered at this stage in the West Middlesex water sample, 100 c.c. of phenolised broth, was inoculated with 20 c.c. of the water, and the mixture incubated at 37° C. for 48 hours. The broth, however, remained limpid. In this water sample, therefore, typhoid bacilli had practically ceased to exist.

From this experiment it appears that typhoid bacilli planted without the addition of nutritive material in sterile West Middlesex water, suffer at first a considerable diminution (in eight days); that then their number increases again (25 days); after which they rapidly decrease (40 days); so that at the end of 85 days none could be detected. The result was, however, quite different as regards the other two waters kept under the same experimental conditions. Thus, in the New River water considerable decrease of the bacilli was noticed in 25 days; a further slight decrease after 40 days; but even at the end of 85 days the typhoid bacilli could be easily demonstrated in 0·5 c.c. of this water. And a similar result as regards persistency of the microbe was obtained with Kent water, though here at the end of 25 days a temporary distinct increase was noticed.

(B.) *Cholera Vibrios in London Waters Filtered and Sterilised.*

Plate cultivations were made of the samples immediately after inoculation, with the result that in all three of them colonies appeared in such abundance (though 0·01 c.c. only was used in each instance) that their number could not be counted.

Eight days after inoculation the samples were tested again, using this time 0·005 c.c. for each plate. But the colonies were still so closely aggregated that their number could not be counted.

Twenty-five days after inoculation they were further tested, using again 0·005 c.c. for each plate.

At this date, the colonies in West Middlesex sample were distinctly less crowded together than on the former occasions; but in the Kent and New River water samples they were still densely packed.

After 40 *days*, the waters were tested again, using 0·005 c.c. for each plate:—

(*a.*) West Middlesex water now yielded 728 colonies per plate, or 145,600 per cubic centimetre.

(*b.*) New River water yielded about 2,000 colonies per plate, or 200,000 per cubic centimetre.

(*c.*) Kent water yielded about 1,500 colonies per plate, or 150,000 per cubic centimetre.

After lapse of 85 *days*, 0·01 c.c. from each of the three waters was added to 10 c.c. of peptone salt solution in separate test tubes, and these were incubated for 24 hours at 37° C. At the end of the 24 hours all the tubes were turbid; and they each contained — as was proved by examination of fresh and stained cover-glass preparations and by sub-culture in gelatine plates—cholera vibrios in pure culture. The cholera-red reaction, too, was in each instance very marked.

It is thus seen that sterile London waters inoculated with abundance of cholera vibrios did not during eight days show, in any one of three samples, appreciable diminution in number of the vibrios. The first distinct diminution of the vibrios was observed in West Middlesex water after 25 days, and after 40 days their diminution therein was conspicuous. Similarly there was, but to a less degree, diminution, after lapse of 40 days, of the vibrios in the New River and Kent waters. But after 85 days, 0·01 of a cubic centimetre of any one of the three waters yielded, on addition to peptone salt solution, cholera vibrios in pure culture.

In order to ascertain whether, as had been the case with sterile distilled water, initial inoculation of these London waters of Series IV. with a much smaller amount of growth (whether of typhoid bacillus or of cholera vibrio) discouraged persistence in them of the organisms, another experiment was carried on simultaneously with the foregoing. It differed solely in the circumstance that the amount of growth introduced was considerably less. To this end a platinum-wire loopful of typhoid bacilli and of cholera vibrios respectively, was taken from the agar cultures of the one and the other microbe at the same time as in the above series, and was distributed in each instance in a few cubic centimetres of sterile salt solution, of which mixture a few drops (3 to 5 only) were transferred to experimental flasks. Plate cultivations were then made, using for each plate 0·01 of a cubic centimetre.

The result was that:—

Typhoid bacillus.
- (*a.*) West Middlesex water yielded 1,200 colonies per plate, or 120,000 per cubic centimetre.
- (*b.*) New River water yielded about 2,000 colonies per plate, or 200,000 per cubic centimetre.
- (*c.*) Kent water yielded about the same number of colonies as (*b.*).

Cholera vibrio.
- (*a.*) West Middlesex water yielded about 120,000 colonies per cubic centimetre.
- (*b.*) New River water, and
- (*c.*) Kent water yielded each about 200,000 colonies per cubic centimetre.

After 40 *days* the flasks were tested again, using 0·25 of a cubic centimetre per plate, with this result:—

Typhoid bacillus.
- (*a.*) West Middlesex water yielded no colonies.
- (*b.*) New River water yielded 1 colony per plate, or 4 per cubic centimetre.
- (*c.*) Kent water yielded 364 per plate, or 1,456 per cubic centimetre.

Cholera vibrio.
- (*a.*) West Middlesex water yielded no colonies.
- (*b.*) New River water yielded 296 colonies, or 1,184 per cubic centimetre.
- (*c.*) Kent water yielded about 800 colonies, or 3,200 per cubic centimetre.

This experiment shows, I think, that the number of microbes originally introduced has much to do with the decrease, and with the amount of decrease, of the microbes during experiment. But here, as also in the preceding experiment, decrease both of typhoid bacillus and of cholera vibrio was much more marked in the West Middlesex water than in the New River and Kent waters.

Finally, and *after lapse of* 85 *days*, phenolated broth tubes were inoculated in each instance with 5 c.c. of water from the three typhoid bacillus flasks, and test-tubes containing the peptone salt solution were similarly inoculated in each instance with 5 c.c. from the three cholera vibrio flasks. As a result, the test-tubes containing typhoid and cholera samples, respectively, of West Middlesex water remained perfectly clear while the test-tubes containing New River and Kent waters became turbid; and samples from these latter tubes yielded, on plate cultivation, colonies of typhoid bacillus and of cholera vibrio respectively, in pure culture.

SERIES V.—TYPHOID BACILLI and CHOLERA VIBRIOS in LONDON WATERS drawn from the TAPS within HOUSES and not subjected to FILTRATION or to STERILISATION.

These experiments were, like the others, made with the West Middlesex, New River, and Kent waters. 100 c.c. of each of these waters were placed in sterile flasks, which were then inoculated with typhoid bacilli and with cholera vibrios respectively, from recently established actively growing agar-cultures of the microbes 48 hours old. As before, a small platinum-wire loopful of the culture for experiment was distributed in a few cubic centimetres of sterile salt solution, and 0·1 c.c. of the mixture was introduced into the experimental flask. No change was hereby produced in the transparency of the water in any case. The flasks were placed in a cupboard at the temperature of the laboratory, the object being to see how long the typhoid bacilli and cholera vibrios respectively were capable of surviving in their struggle with the numerous water-bacteria originally contained in the samples. As is well known, these latter multiply readily in water kept under the above conditions.

The first examination for *cholera vibrios* was made 14 *days* later, by inoculating test tubes containing 10 c.c. of peptone salt solution with a drop each from the flasks containing this microbe. As a result, all these peptone cultures after incubation for 24 hours at 37° C. were found to contain, copiously, typical cholera vibrios, as was shown by examination of cover-glass preparations and by plate cultures made of the peptone solution.

The several waters were again tested for cholera vibrios *three days* later, with the same result as regards West Middlesex and Kent water, but with negative result (after only 24 hours incubation) as regards the New River water. Forty-eight hours later, however, (*i.e.*, after 3 days), these New River peptone tubes were turbid and contained numerous comma-bacilli in the involution stage, *i.e.*, swollen up, club shaped, and distorted. Gelatine plate sub-cultures from these New River peptone tubes yielded typical colonies of cholera vibrios, and the peptone cultures themselves gave, when tested with sulphuric acid, distinct cholera-red reaction.

Thirty-six days from the date of inoculation, the water in the several cholera flasks was tested again in peptone culture, using now for each test tube 1 c.c. of the sample under examination. After 24 hours incubation at 37° C., all the peptone tubes developed good growth of cholera commas. On the same day plate cultivations in gelatine were also made, each plate with 0·25 c.c.; and as a result, amongst the numerous colonies of different bacteria in both the New River and Kent water, some few typical colonies of cholera vibrios could be recognised, and these on sub-culture presented the usual features. In the gelatine plate inoculated from West Middlesex water, no cholera colonies could be recognised.

After lapse of 42 *days*, the testing of the three samples was repeated, the peptone tubes each receiving 1 c.c. of water. The result was again a crop of cholera vibrios in each tube.

Hence it is seen that these London waters differ altogether from those continental (normal and non-sterile) waters, in regard of which it is stated that cholera vibrios retain their vitality in them for a short while only. In these London waters, living, *i.e.*, cultivable, cholera vibrios could still be detected in a cubic centimetre of each sample six weeks after addition of them to the samples.

The results observed as to the persistence of *typhoid bacilli* in these three non-sterilised London waters are equally interesting. The waters were tested by means of phenolised gelatine plates, whereby the great majority of ordinary water-bacteria were either inhibited or retarded.

Eighteen days after inoculation of the waters with typhoid bacilli, phenolated plates were made, each with a 0·1 of a cubic centimetre of one or another water. The result was that in all samples colonies of undoubted typhoid bacilli could be recognised, as was confirmed by subculture.

After 36 *days*, they were tested again in phenolated plates, each plate receiving 1 c.c. of water. No typhoid colonies could now be recognised either in the New River or Kent waters, though some undoubted typhoid colonies were observed in the West Middlesex water.

After 42 *days*, test-tubes containing each 10 c.c. of phenolated broth were inoculated with 5 c.c. of water in each instance. The result was that in none of these London water samples could typhoid bacilli be discovered after 48 hours' incubation, either directly by microscopic examination or indirectly by gelatine plate cultivation.

From these experiments it is seen then, that 18 days after their inoculation with the microbe, living typhoid bacilli were still present in 0·1 c.c. of all three waters; that after lapse of 36 days, though they could not be discovered in 1 c.c. of New River or of Kent water, they were still present in 1 c.c. of West Middlesex water; and that after lapse of 42 days their number in the several samples had become so far reduced that 5 c.c. of the water, in each instance, failed to give evidence of the existence of the microbe.

The above experiments show also conclusively that of the two microbes under test, the cholera vibrio is considerably the hardier one it survives much longer (six weeks) in all of the London waters that were under observation.

SERIES VI.—TYPHOID BACILLI AND CHOLERA VIBRIOS IN OTHER NATURAL WATERS.

Having now acquired some definite experience as to the behaviour of typhoid bacilli and cholera vibrios in distilled water and in waters supplied by London companies, I proceeded to test in the same direction other waters. Three different kinds were experimented with:—

(1.) Water from a well belonging to a cottage standing in its own grounds in a village, East Harting, at the foot of the Sussex downs. This well is of great depth; the water in it is, at its highest level, 50 feet from the surface. The whole neighbourhood is Chalk, and I presume the water is "chalk" water; its marked hardness suggests this also.

(2.) Rain water which, during an extremely heavy downpour of rain at East Harting, was received in a clean basin previously well washed out with the rain water.

(3.) From a lake at West Harting in Sussex. This lake, which is oblong in shape and covers an area of about two or three acres, is supplied by underground springs; it has no affluent river or other watercourse, although there is a constant overflow from it. The shores of the lake are thickly covered with reeds, and are in effect marshy bogland.

In all these instances a sterile bottle was filled with the water, was well stoppered, and was brought to my laboratory for the experiments now to be described.

As in the experiments of Series IV., 100 c.c. of each water were placed in sterile flasks, which were heated for 10–15 minutes to a temperature

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of 62–65° C. This was sufficient to sterilise the waters; plate cultivations then made with 1 c.c. of each failed to yield any growths.

After cooling, the flasks were inoculated; one set of each water with typhoid bacilli, another with cholera vibrios. As before, the microbes were taken in a platinum-wire loop from the surface growth of vigorous agar-cultures (grown for 48 hours at 37°) and distributed in sterile salt solution, a few droplets (3–5) of such mixture being added to each flask. Immediately afterwards the flasks were well shaken up, and plate cultivations were made with this result:—

1. *Typhoid bacilli* in—
   (*a.*) Well water, about 40,000 colonies per cubic centimetre.
   (*b.*) Rain water, about the same.
   (*c.*) Lake water, about the same.
2. *Cholera vibrios* in—
   (*a.*) Well water, about 28,000 colonies per cubic centimetre.
   (*b.*) Rain water, about 50,000 " "
   (*c.*) Lake water, about 60,000 " "

After 14 *days*, the flasks were tested again; with this result:—

1. *Typhoid bacilli* in—
   (*a.*) Well water, about 4,000 colonies per cubic centimetre.
   (*b.*) Rain water, about 30,000 " "
   (*c.*) Lake water, about 30,000 " "
2. *Cholera vibrios* in—
   (*a.*) Well water, about 3,400 colonies per cubic centimetre.
   (*b.*) Rain water, about 12,000 " "
   (*c.*) Lake water, about 20,000 " "

After 28 *days*:—

1. *Typhoid bacilli* in—
   (*a.*) Well water, no colonies discoverable.
   (*b.*) Rain water, over 10,000 colonies per cubic centimetre.
   (*c.*) Lake water, over 20,000 " "
2. *Cholera vibrios* in—
   (*a.*) Well water, about 900 colonies per cubic centimetre.
   (*b.*) Rain water, about 1,500 " "
   (*c.*) Lake water, about 54,000 " "

After 35 *days*:—

1. *Typhoid bacilli* in—
   (*a.*) Well water, no colonies discoverable.
   (*b.*) Rain water, about 5,000 colonies per cubic centimetre.
   (*c.*) Lake water, about 25,000 " "
2. *Cholera vibrios* in—
   (*a.*) Well water, about 800 colonies per cubic centimetre.
   (*b.*) Rain water, about 1,200 " "
   (*c.*) Lake water, about 26,000 " "

Owing to other and pressing work this particular investigation could not be continued. But the few experiments here recorded suffice to show that the well water behaved in a remarkably different way from the rain and lake waters, as regards both the typhoid bacilli and the cholera vibrios. In this well water both kinds of microbe had suffered conspicuous diminution after an interval of 14 days, and still more markedly after 28 days. As in the other experiments, however, the cholera vibrio proved in all three waters far more resistent than the typhoid bacillus. The fact that the typhoid bacilli after four weeks could not be discovered any longer by the plate cultivations in the well water, whereas at this period they had decreased in the lake water only to half their original number, may have been, and probably was, due to the shores of the lake

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being marshy land covered with reeds wherein wild duck were breeding; so that its water contained a large amount of organic matter, and afforded therefore better pabulum for the microbe. It is difficult, however, to understand how it happened that the rain water proved better suited for sustaining both the typhoid bacilli and the cholera vibrio in a living condition than the well water. I record the fact, but am unable to supply an explanation, unless, indeed, it is to be referred to the presence in the well water of some substances derived from the soil and inimical to both the microbes, which substances were absent in the purer rain water.

In addition to my observation of the typhoid bacillus and of the cholera vibrio, I have also made some experiments with *bacillus coli*. This microbe was isolated from the intestine of the healthy human subject and kept in sub-cultures as stock in the laboratory. I have on various occasions had to examine waters from polluted wells, from polluted rivers (Thames water), as also polluted sea water; and have in most instances obtained bacillus coli from such water by the phenol method which was used for the detection of the typhoid bacillus. As a result of my experiments on the persistence in water of bacillus coli—made on exactly the same plan as was adopted with the typhoid bacillus—I am not altogether in accord with Prof. Frankland.* I find that bacillus coli, in some experiments at any rate, is very little if any hardier than the typhoid bacillus in various waters (sterile tap water and non-sterile tap water, for instance), and that its longer persistence therein is doubtful.

Here are the details of some of my experiments:—

100 c.c. in each instance—(1) of sterile tap water; (2) of non-sterile tap water; and (3) of sterile distilled water—were inoculated with bacillus coli. The number of bacilli thus introduced was determined by plate cultivation, and was found to be between 40,000 and 42,000 per cubic centimetre in each flask.

(*a*.) After lapse of a fortnight, plate cultivations were made with this result:—

(1.) Sterile tap water yielded 322 colonies per cubic centimetre.
(2.) Non-sterile tap water „ 12 „ „ „
(3.) Sterile distilled water „ 2 „ „ „

So that in a fortnight the diminution was in all cases very great, especially in the sterile distilled water.

In a second set of experiments, and working with a different stock of bacillus coli, these bacilli could be easily recovered in large numbers of colonies from the waters after lapse of a fortnight. In this case the same waters were used, viz., sterile tap water, non-sterile tap water, and sterile distilled water. The bacilli introduced were under 60,000 and above 40,000 per cubic centimetre in number. Tested after a fortnight it was found that the sterile tap water yielded over 10,000, the non-sterile tap water over 1,000, and the sterile distilled water over 4,000 colonies per cubic centimetre.

Before leaving the subject of the ability of the typhoid bacillus, and of Koch's cholera vibrio, to maintain their existence in water, I would, by recapitulation, emphasise certain points that I regard as established as a result of the investigations I have recorded.

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* Proceedings of the Royal Society, vol. 56, N. 338.

First, I would insist that no conclusion as to the non-presence of any particular microbe in a given sample of water can justifiably be arrived at *unless* large volumes of the water of experiment have been subjected to bacterioscopic tests. If in a few drops of the water the particular organism is not found, then larger and larger volumes must be examined. In the case of the typhoid bacillus or of bacillus coli, this can be easily done by the method of Berkefeld or Chamberland-Pasteur filtration, afterwards making culture of the deposit on the outside of the filter in phenolised gelatine or in phenolised broth. As regards the cholera vibrio, it is now a universally accepted practice (*vide* Koch, Dunbar and others), and one which yields the best results, to examine the water by aid of the Dunham peptone solution. By this method a sufficient volume of the water (50—200 c.c.) is placed in each of several sterile flasks, to which peptone salt solution of definite strength is added* in amount sufficing in each instance to make the total water in the flask contain 1 per cent. peptone. The flasks are then incubated for 24 (if necessary for 48) hours, when the superficial portion of the fluid is examined by means of cover-glass preparations, and by culture in peptone salt tubes and in gelatine plates. If the result be negative at this stage, secondary and tertiary sub-cultures should be instituted before a definite verdict be pronounced as to absence of the vibrio.

Secondly, it is essential in these testings of the ability of micro-organisms to maintain themselves in water or in other fluid, that only recently prepared active cultures be used. It is well known that recent cultures alone possess strong vitality; cultures which have undergone prolonged cultivation lose, as a rule, much of their ability to resist adverse conditions. Thus, an agar culture of the typhoid bacillus grown for 1–2 days at 37° C., is certainly more active and vigorous than an agar culture seven days old; and a gelatine culture of typhoid bacillus grown at 20°-21° C., for seven days, is considerably more vigorous than one grown on agar or in broth for the same length of time at 37° C. And the same applies to cholera cultures. Agar surface cultures of Koch's vibrio grown at 37° C. are, after four or five days, considerably less active physiologically than within the first 48 hours. So that if waters or other fluids are to be tested for their inhibitive action on bacteria, good, recently prepared, active cultures of the microbes of experiment ought to be used. It is quite possible that—apart from the different character of the waters (which, to judge from the foregoing experiments, would appear to be of no small importance), and from the different amount of nutritive matter introduced—the contradictory statements that have been made as to the vitality of microbes in water media may be due to the cultures of typhoid bacillus, and of cholera vibrio, used for experiment not being in all cases recently established cultures.

Thirdly, with reference to nutritive material introduced along with the culture into the water. This point has been already discussed by me at some length, and its importance as regards the persistence of both the typhoid bacillus and the cholera vibrio insisted upon. Prof. P. Frankland has also drawn attention to it in his and Mrs. G. Frankland's book on water analysis. It is obvious that the presence in water of nitrogenous organic matter must materially affect the vitality of these microbes, and that the addition of even small quantities of such material might suffice to give sustenance to not a few of them. Now, in all typhoid and cholera contaminations of waters, under natural conditions, there is not merely pollution with the microbes but pollution also with organic (and nutritive) material contained in the stools themselves. This was the case in the Caterham typhoid fever epidemic, in the Worthing typhoid fever epidemic, in the Hamburg cholera epidemic, in the Nietleben cholera epidemic, &c. Wherefore, in laboratory experiments on water of the sort above recorded, it is important that small traces of nutritive material be added thereto. As has been shown, this was done in several of the foregoing experiments, and with the result that the vitality of the typhoid bacillus and of the cholera vibrio was enhanced to an extent not previously recorded by other observers; to an extent, indeed, more in harmony with the hitherto observed facts concerning the conditions of spread of typhoid fever and of cholera by water supplies.

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* A standard sterile peptone salt solution is kept in the Laboratory. It contains 10 grains (dry) of peptone, and 10 grains (dry) of salt, per 100 c.c. of distilled water.

Finally, in bringing this report to a conclusion, I would insist once again on the especial importance, when testing natural waters for the typhoid bacillus or for the cholera vibrio, of submitting a sufficiency of the suspected water to examination. In this connexion I have to note that Professor Percy Frankland, from negative results of his experiments made each time with small quantity of unsterilised Thames water, draws the conclusion that Thames water collected at Hampton contained on one and another occasion no bacteria resembling either the typhoid bacillus or bacillus coli. Such a conclusion, which I have no doubt will be referred to over and over again by those who vaunt the excellency of the Thames water for drinking purposes, is in my view unwarranted. Professor Frankland examined from time to time small quantities only (0·5–1 c c.) of the water for typhoid bacillus and bacillus coli respectively, by means of the phenol (Farietti) method, and he failed to find either the one or the other microbe. I, in the course of my examinations of London filtered waters drawn from the companies' hydrants, and of unfiltered Thames water collected above Hampton, have by a different method found bacillus coli in abundance: but this method took account of larger quantity of water than 0·5–1 c.c. What I did, and what I would recommend Professor Frankland to do on future occasions, was to search by means of the Parietti method large volumes of the water: 1,000–2,000 c.c. This quantity was driven by me through a Berkefeld filter; the whole of the outside of the filter (that is the whole of the intercepted particulate matter) was then brushed off with a clean brush, and the material thus collected distributed in a small quantity (5–10 c.c.) of sterile water. Of this mixture 0·5–1 c.c. was used in each instance for inoculation of multiple phenolised gelatine plates and phenolised broth tubes. In this way a large volume (some 200–600 c.c.) of each original water sample was strictly searched by me.

As illustrating the need for close scrutiny of water samples by the above method, I would note that I have had repeatedly submitted to me for bacterioscopic examination water (well, river, and surface water) in which by the ordinary plate cultivations made (merely for enumeration of the bacteria generally) with 0·5 or 1 c.c. of the water, no trace of bacillus coli could be detected, but where nevertheless in the particulate matter of large volumes of the same water (prepared by the above process of filtering through Berkefeld filter) abundance of this bacillus was detected.

No. 4.

FURTHER REPORT on the ANTAGONISMS of MICROBES; by DR. KLEIN, F.R.S.

APP. B. No. 4.

On the Antagonisms of Microbes; by Dr. Klein.

In my account of my investigation of this subject in 1892–93,* I pointed out that it is not yet known, in regard of many specific infectious diseases, how far the manifestations of the malady are due to the mere presence in the infected animal of a particular bacterium, *per se*, or result from poisoning by the metabolic products which are formed in the animal by the life processes of the microbe. And I insisted on need for distinction between the protoplasm (proteins) and the metabolic products (toxins) of the microbe of a given disease if, for the purpose of rendering the animal-body proof against the specific cause thereof, trustworthy inoculation-material is to be derived from the microbe associated therewith. I had at that time been working with a number of dissimilar microbes, which I had found severally—when their intracellular substances were introduced into the peritoneum of experimental animals—to produce in guinea-pigs one and the same malady. Also, I had found that guinea-pigs thus made ill by intraperitoneal injection of the intracellular poison of any one of these microbes were thereafter protected against intraperitoneal infection by means of the protoplasm of the others. And I inferred that the protoplasm (intracellular substances) of all the microbes with which I was then working† contained (physiologically) one and the same poison; and that the poison thus found common to all of them must needs be *non-specific* and, consequently, in no way responsible for the manifestation of the diverse diseases certain of these microbes had been found able to induce. This provisional conclusion I put to further test, later on,‡ and found in regard of bacillus anthracis and bacillus diphtheriæ—microbes which notoriously are pathogenic by means of their metabolic products (toxins)—that in neither case had the protoplasm (intracellular substance) of the microbe any appreciable physiological effect when injected into the peritoneum of guinea-pigs, and that guinea-pigs thus dealt with obtained thereby no demonstrable immunity against anthrax or against diphtheria.

It will be observed that this further experience, in confirming my provisional inference as to the identity, and, therefore, the non-specificity, of the intracellular substance of a variety of microbes, went to strengthen the doubt expressed by me in my report for 1892–93 as to the protective value of anti-cholera inoculations that consisted *solely* of the intracellular substances of Koch's vibrio ;§ a hesitant attitude which, as was to be expected, has subjected me to much criticism. Pfeiffer and Issaeff, for instance, demur to the conclusions at which I arrived in 1892–93, with regard to the identity of the intracellular poison furnished by the several microbes with which I was working. They contend‖ that the protection conferred by me on guinea-pigs, against poison contained in microbic protoplasm, by antecedent injection into the peritoneum of these animals of the intracellular substance

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* Report of Medical Officer, 1892–93, pages 367–384.

† Koch's cholera vibrio, the vibrio of Finkler, bacillus prodigiosus, proteus vulgaris, bacillus coli, the bacillus of typhoid fever, and staphylococcus aureus.

‡ Report of Medical Officer, 1893–94, pages 469–478.

§ In expressing this doubt, in the report referred to, I understood that Haffkine's anti-cholera inoculations were made with the intracellular substances alone of the cholera vibrio. I have been, however, lately informed by Mr. Haffkine that he now uses for his anti-cholera injections in the human subject *living* culture of this vibrio.

‖ Zeitschrift für Hygiene, Vol. XVII., part 2.

(minus metabolic toxin) of any one of several bacteria, has nothing in common with specific immunity. A similar resistance of the peritoneum to protoplasmic poisoning can, they affirm, be established in guinea-pigs by antecedent injection into the peritoneum of a variety of dissimilar substances, such as salt solution, normal blood serum, nuclein solution, &c.* Further, they say, that the resistance obtained by these and by my injections against a normally fatal dose of Koch's vibrio, administered intraperitoneally, is local only, and of very temporary character. And they go on to contend that a specific (lasting) resistance (immunity) against a fatal (intraperitoneal) dose of Koch's vibrio can be obtained solely by antecedent injection of this microbe, not by injection of any other. They maintain therefore that the protection afforded by me to guinea-pigs, as a result of intraperitoneal injection of the protoplasm of microbes other than Koch's vibrio, was in no sense a specific protection; not one, that is, to be trusted, as affording these animals any real immunity against a full dose of the living cholera microbe.

Pfeiffer and Issaeff have misunderstood me. I have not claimed that my antecedent injections of a given animal with one and another microbic protoplasm protected that animal against cholera infection; and, indeed, certain of my experiments, recorded in my report for 1892–93, suffice to show that I was not in a position to make any such claim. For instance, I stated (page 383) that a guinea-pig rendered tolerant of the intracellular cholera poison by previous repeated subcutaneous injection of this substance is still susceptible to, and succumbs after, injection into it of the toxins that had been produced by this microbe in gelatine culture. This being the case, it was not to be expected that a guinea-pig rendered resistant to a certain extent to Koch's cholera vibrio by antecedent intraperitoneal injection of the intracellular substance of bacillus prodigiosus, should be any better able to withstand a large dose of the living cholera microbe (also intraperitoneally injected) than an animal of like age and weight antecedently protected by administration of the protoplasm *alone* of this microbe of cholera. I am quite in accord with Pfeiffer as to the intraperitoneal injection of guinea-pigs with *living* cholera vibrios affording such of the animals as withstand the injection a more trustworthy protection against further injection in large amount of the living vibrio *plus its toxin* than that which is obtainable by injection of the *dead* protoplasm of the microbe. But living and dead microbic protoplasm are, as material for protective inoculation, on a wholly different footing; and accordingly Pfeiffer, in using living vibrios for antecedent injection of the peritoneum of guinea-pigs, has departed from the conditions of experiment whereon my inferences were based. The reason for expecting a different result as regards protection against cholera infection, according as living and dead protoplasm of the cholera vibrio is used in preparatory injection of the guinea-pig, is as follows:—

The changes produced in a guinea-pig's peritoneum by previous injection of the dead protoplasm of Koch's vibrio or of other microbe, renders that peritoneum (if the animal survive) hostile to the cholera organism in this sense, namely, that living cholera vibrios subsequently introduced there in small quantity all die without multiplying, and without, therefore, accumulating in the peritoneum a virulent dose of their protoplasm. On the other hand, the introduction into the peritoneum of a guinea-pig of a non-fatal dose of the living cholera vibrio operates to protect the animal against further cholera injection in two ways. By increase of amount of immunising substance derived from microbic protoplasm, owing to multiplication within it of the vibrio, the peritoneum is rendered hostile to other cholera vibrios subsequently introduced from without; while toxin resulting from such multiplication (plus their life processes) of the originally introduced living vibrios brings about production in the body of antitoxin, which tends thenceforward to neutralise there any super-added cholera toxin, whether separately introduced or manufactured by the life processes of the living vibrios contained in a new dose of cholera culture. So that when the living protoplasms of, say, bacillus prodigiosus and of Koch's cholera vibrio, are contrasted with reference to their effect on the guinea-pig's peritoneum in protecting it against subsequent injection with virulent cholera material, bacillus prodigiosus must needs be at a disadvantage. Under no conditions can it manufacture cholera toxin, whereas Koch's vibrio may, in the circumstances of the experiment, find opportunity of doing so.

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* Pfeiffer does not, I think, do full justice to my results when he says that salt solution and ordinary serum have just as much (or just as little) ability to confer resistance against the cholera vibrio as either bacillus prodigiosus or bacillus coli. That this is not the case I am confident, since guinea-pigs intraperitoneally injected by me, whether with bacillus coli or bacillus prodigiosus, have resisted a normally fatal dose of the cholera vibrio at an interval of fully three weeks from the preparatory injections.

Wherefore, while I quite agree with Pfeiffer's conclusion as to a specific resistance against the cholera vibrio conferred by previous injection of the living microbe, my acceptance of his conclusion in no way invalidates my own conclusions as to the physiological identity of the intracellular substance of different microbes, as evidenced by the ability of the intracellular substance, *per se*, of one microbe, *e.g.*, bacillus coli, to confer resistance against the intracellular substance, *per se*, of another microbe, as, for instance, the cholera vibrio.

With a view of further illustrating the fact, upon which I have all along insisted, namely, that intraperitoneal injection of the intracellular substance, *per se*, whether of Koch's vibrio or of the vibrio of Finkler, does not protect guinea-pigs against subsequent injection per peritoneum of the metabolic products (toxin) of the one or the other microbe, I cite the following experiments. They tend, as I consider, to demonstrate complete absence, so far as these microbes are concerned, of interdependence in a physiological sense of their protoplasms and their toxins.

SERIES I.—EXPERIMENTS WITH THE VIBRIO OF CHOLERA.

(1.) Six guinea-pigs, each weighing between 300 and 350 grammes, were injected (*September 15th*) intraperitoneally with material from agar cultures of the cholera vibrio* which had been incubated at 37° C. for 48 hours. The whole of the surface growth from two cultures, measuring 6 centimetres by 2 centimetres in each instance, was scraped off and distributed in 8 c.c. of sterile bouillon, which was then heated for 10 minutes at 65°–70° C. with a view of sterilising the bacilli. One cubic centimetre of the sterilised mixture (corresponding to ¼ of the scrapings of a single culture) was then injected into each of the six guinea-pigs. All the animals became ill in the afternoon, but had recovered next morning.

(2.) A week later (*September 22nd*), intraperitoneal injection of the six guinea-pigs was repeated, each animal receiving the same quantity of the same kind of agar culture, sterilised. All the animals were slightly

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* This had been derived from the intestinal contents of a typical case of fatal Asiatic cholera brought by a vessel into the Thames (Denton) about a month previously.

App. B. No. 4.

On the Antagonisms of Microbes; by Dr. Klein.

ill in the evening (they were quiet and did not feed well); but they appeared all right again the next morning.

(3.) The experiment was repeated in exactly the same manner on *October 6th*, *i.e.*, after three weeks. The animals did not now react at all.

(4.) At the end of about four weeks, *i.e.*, on *October 12th*, the above guinea-pigs were again inoculated with cholera vibrios* taken from the surface of the agar culture. The material was dealt with in the same way as before, except that the bouillon mixture was not sterilised; *living* vibrios were thus injected into their peritoneums for the first time. The amount injected in each instance was $\frac{1}{13}$ of the scrapings of a culture, a quantity just sufficient when injected into a normal guinea-pig to kill it in 48 hours. As a result, the six guinea-pigs showed no reaction at all; so that it became quite clear that the three previous injections of sterilised vibrios (intracellular substance) had been quite sufficient to furnish the animals with complete resistance against living vibrios when the latter were injected in quantity just sufficient to kill an unprepared guinea-pig in 48 hours.†

Be it noted that in these experiments I was anxious not to inject more than a minimal fatal dose of living culture; since, had I ventured to inject a larger dose it would, judging from former experiments, have vitiated the result. Thus, a larger dose, say, $\frac{1}{8}$ or $\frac{1}{9}$ of the scraping of a culture tube, though it would unquestionably have made the animal ill, would have permitted it in all probability to recover; in which case multiplication of some of the vibrios in the peritoneal cavity could hardly have been avoided, with production there of toxins. These, although not in a fatal quantity, would nevertheless have entirely altered the character of the experiment, the object of which was to obtain guinea-pigs which had become, without interaction of toxin, immunised against the intracellular substance of the dead and of the living cholera vibrio.

(5.) On *October 20th*, *i.e.*, after lapse of 35 days from the beginning of the experiment, the same guinea-pigs were each intraperitoneally injected with $\frac{1}{10}$ of the scrapings of an agar culture of living cholera vibrios. The animals remained quite unaffected, thus proving that they were now considerably more immunised; for a control guinea-pig that had been injected intraperitoneally with $\frac{1}{10}$ of the same agar culture of the living vibrios was very ill in the evening and died in about 28 hours.

(6.) On *October 27th*, *i.e.*, 42 days after commencement of experiment, the same animals were intraperitoneally injected with $\frac{1}{7}$ of the scrapings of an agar culture of the living cholera vibrios. They were slightly ill in the evening, and although they were quite right the next morning, this was unfortunate, since it signified that the dose ($\frac{1}{7}$ of the scrapings) was a little too large. It is true that the constitutional disturbance of the animals in the evening of its injection was only slight (they were a little quiet and did not seem to be taking their normal amount of food), nevertheless it was to be thought of as indicating that there had occurred intraperitoneal multiplication of the cholera vibrios. It was hoped, however, that this could not have been considerable, and that any resistance thereby acquired against cholera toxin was only nominal.

The next stage was to test these guinea-pigs by intraperitoneal injection of the *metabolic products* of the cholera vibrio.

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* In all these injections the vibrios of the same stock (Denton) were used.

† As may be remembered from my previous report, the doses that were used in my former experiments were larger than this, but then they produced death within 20 or 24 hours.

For this purpose cultures on solid blood serum were made from the same stock of cholera vibrios as before, *i.e.*, from the recent typical cholera case that had been brought into the Thames. After inoculation of this medium, the test tubes containing it were sealed so as not to allow any free exchange of oxygen. This course was adopted for the reason that Hüppe's researches have shown that under such conditions of deprivation of oxygen the metabolic products obtained are of a high degree of poisonous potency. Incubated at 37° C., copious growth resulted in these tubes with typically rapid liquefaction of the serum. After upwards of four months, when liquefaction was quite complete, and when, under the microscope, only granular matter, but no commas, could be found, about $\frac{3}{4}$ of a cubic centimetre of the culture fluid were injected intraperitoneally into each of two control guinea-pigs. Both animals were very ill in the evening, and were found dead in about 20 hours. On post-mortem examination they showed extensive hæmorrhagic peritonitis; but no living commas were obtainable either from their peritoneal fluids or from the serum culture that was used for injecting them. From this it follows that the death of these guinea-pigs was due to toxin poisoning.

The six guinea-pigs which had been immunised against the intracellular poison of Koch's vibrio were now each injected intraperitoneally, on *November* 13*th* (*i.e.*, 17 days after last injection with the living microbe) with the same amount of the particular serum culture which was used severally for the two control guinea-pigs just mentioned. The result was striking: all six animals were very ill in the evening, and next morning, *i.e.* before 20 hours were over, two were found dead. The others were at this date still very ill, *i.e.*, were very quiet, huddled up, their eyes closed, their breathing rapid, and they did not feed. On the third morning another guinea-pig was found dead—it was practically dying on the evening of the second day; and on the evening of this day a fourth guinea-pig was found dying. The other two seemed better, and now fed a little. Both these had still further improved on the fourth day, and they recovered. So that of six guinea-pigs that had been well immunised against a fatal dose of intracellular substance of the cholera vibrios, four readily succumbed to the cholera toxin, while the other two, although very ill at first, ultimately recovered.

The conclusion is, I think, justified that these guinea-pigs though protected against the intracellular substance of Koch's vibrio, had obtained little if any protection against its metabolic toxin. Of the six guinea-pigs, be it noted, two proved not at all protected, other two were only slightly protected, and two only just escaped death. The circumstance that the two last-mentioned did as matter of fact recover may well have been due to the dose of living cholera culture administered on *October* 27*th* having been a little too large ($\frac{1}{7}$ of a virulent agar culture), so that the animals became slightly affected, owing to a certain limited amount of multiplication of vibrios within their peritoneal cavities, with a corresponding production there in limited amount of toxin. This, I take it, is the simplest explanation of the fact that two of the six guinea-pigs were found to resist the virulent cholera toxin to which they were subjected.

SERIES II.—EXPERIMENTS WITH FINKLER'S VIBRIO.

(1.) Six guinea-pigs were injected intraperitoneally with an agar culture of Finkler's vibrio, which had been grown at a temperature of 20° C. for about one week. The growth of the microbe was scraped from the surface of the agar and distributed in bouillon, and the mixture sterilised by exposing it for 10 minutes to a temperature of 65°–70° C. Of this sterilised mixture an amount representing $\frac{1}{8}$ of the scrapings of a culture tube was injected into each guinea-pig. All the animals were quiet in the evening, and next morning they were still quiet and off their feed; but on the following day they were seemingly all right again.

(2.) Seven days later, the six guinea-pigs were re-injected intraperitoneally with sterilised culture of the same kind and in the same amount as before. All of them were slightly ill in the evening, but had seemingly recovered next morning.

(3.) After lapse of additional 13 days, they were re-injected intraperitoneally in precisely the same manner, each animal receiving $\frac{1}{8}$ of an agar culture of Finkler's vibrio, sterilised. All of the animals were quiet in the evening, but had quite recovered next morning.

(4.) Ten days later, the experiment was repeated in precisely the same manner, $\frac{1}{8}$ of a sterilised culture being used as before. All the animals were quiet in the evening, but had quite recovered the next morning.

(5.) After eight additional days had elapsed, the experiment was repeated; but this time $\frac{1}{6}$ of the scrapings of a sterilised agar culture of Finkler's vibrio was injected into each animal. One of them seemed quiet in the evening, the other five were quite unaffected, and all appeared quite well next morning.

From this it is seen that after four injections the animals were quite protected against the intracellular poison of Finkler's vibrio; so large a dose as $\frac{1}{6}$ of a sterilised culture of that microbe had practically no effect, whereas $\frac{1}{8}$ of the same culture killed a control guinea-pig in 20 hours.

(6.) After another eight days, these six guinea-pigs were injected intraperitoneally, and for the first time, with $\frac{1}{10}$ of a *living* agar culture of Finkler's vibrio. At the same time a control guinea-pig received intraperitoneally the same dose of the living culture. This animal was very ill in the evening, and was found dead in 20 hours. As regards the six prepared guinea-pigs, two were very slightly affected (being seemingly a little less lively), but next morning all six looked perfectly well.

I now proceeded, as in the case of Series No. I., to test the six Finkler guinea-pigs as to their power of resisting the toxin produced in serum culture by Finkler's vibrio.

This microbe was inoculated on the surface of solidified blood serum, the test tubes containing it being then sealed and incubated at 20° C. for about four months. Like the vibrio of cholera, Finkler's vibrio causes liquefaction of the serum, only somewhat faster. At the end of four months one of the tubes was opened and tested by cultivation for living vibrios, but none could be discovered in it. Next, $\frac{3}{4}$ c.c. of the liquid material were injected intraperitoneally into a healthy guinea-pig. The animal was very ill in the evening, and was found dead next morning; post mortem examination showed that there was much hæmorrhage into its peritoneum but no appreciable amount of exudation.

The six guinea-pigs of Series II. were now, 10 days subsequent to their injection with the living culture of Finkler's vibrio, injected intraperitoneally with the above liquid serum culture of this microbe, each animal receiving $\frac{3}{4}$ of a c.c. thereof. The result was again striking. All six animals were very ill in the evening, and four were found dead next morning. Two (those that had appeared slightly quiet after the injection (No. 6) each with $\frac{1}{10}$ of a living culture) remained very ill during the second day, and during the third day one of them died. The sixth remained quiet and somewhat off its feed during the fourth day, but on the fifth day had seemingly recovered.

It is quite clear, I think, from these experiments that these guinea-pigs, although protected against the intracellular poison of Finkler's vibrio, had practically no resistance against the metabolic products of that microbe; that, indeed, in this respect they practically behaved like unprepared animals.

The next point to be determined was this: Are guinea-pigs which have been by repeated intraperitoneal injections of non-fatal doses of *living* microbe protected against an otherwise fatal dose of the living cultures thereof, protected also against a fatal dose of that microbe's toxin?

Series III.—The Living Vibrio of Cholera repeatedly injected per Peritoneum into Guinea-Pigs.

I prepared five guinea-pigs by injecting them intraperitoneally on five separate occasions with *living* cholera vibrios scraped from the surface of agar cultures of the microbe and distributed in sterile bouillon. Each animal received first $\frac{1}{15}$; then $\frac{1}{13}$; then $\frac{1}{10}$; then $\frac{1}{8}$; and finally, $\frac{1}{6}$ of the scrapings of a culture: and between each injection a fortnight was allowed to elapse. After their first injection the animals were very ill, but fortunately they all recovered. After the fourth and fifth injections they appeared not at all affected. Fourteen days after the last occasion of injection, they were injected, also per peritoneum, with the toxin contained in a serum culture of Koch's vibrio.

This serum culture was that used in Series I., $\frac{3}{4}$ of a cubic centimetre of which killed a normal guinea-pig of about 300 grammes weight in 20 hours. The five guinea-pigs, however, that had been subjected to repeated injections of living cholera vibrios remained, when injected per peritoneum with a similar dose ($\frac{3}{4}$ of a c.c.) of the serum culture, altogether unaffected; thus showing themselves protected against the toxin.

This was not unexpected, seeing that by intraperitoneal injection of living culture not only is intracellular substance introduced into the animal, but the vibrios multiplying within the peritoneal cavity produce there a certain amount of toxin. This process having been presumably repeated on several separate occasions, the peritoneal cavity of the experimental animal might, it was thought, have been rendered immune, not only against the intracellular poison but also against the toxin of the infecting microbe; as indeed was shown to be the case by the experiment in question.

Series IV.—The Living Vibrio of Finkler repeatedly injected per Peritoneum into Guinea-Pigs.

In this series precisely the same lines were followed as were adopted in Series III. with the cholera vibrio. Five guinea-pigs were injected intraperitoneally on five separate occasions with non-fatal but gradually increasing doses of the *living* vibrio of Finkler taken from agar cultures. Ultimately all five were treated with the toxin of the serum culture of this vibrio that was used in Series II. The result was the same as in Series III., viz.: the animals were found to be protected not only against the intracellular substance but also against the metabolic toxin of Finkler's vibrio.

It still remains to be determined, as regards Koch's and Finkler's vibrios, whether the injection of pure toxin in gradually increasing doses protects an animal not only against the toxin but also against the intracellular substance of the microbe.

Pfeiffer has shown* that the blood serum of guinea-pigs which, by repeated intraperitoneal injections with living cholera vibrios, have become fully protected against a large and ordinarily fatal living dose of this microbe similarly administered, develops substances which act germicidally against living cholera vibrios: Guinea-pigs, that is, into whose peritoneal cavities a mixture of a certain quantity of such serum and an otherwise fatal dose of living vibrios are injected, suffer no illness.

In another paper in this volume I have referred to these observations of Pfeiffer, and experiments of my own which have gone to confirm the correctness of his general statement as to the germicidal action of the blood serum of guinea-pigs immunised by repeated intraperitoneal injections of living cholera vibrios. But Pfeiffer goes farther than this. He maintains that the germicidal property of this serum is so specific and exclusive that it acts on the cholera vibrio only, and on no other vibrios; that if in a given instance it does not inhibit a particular vibrio injected along with it into the peritoneum of a guinea-pig, that vibrio is not the vibrio of cholera. In a word, he believes that he is able, by means of his serum, at once to distinguish, among comma-bacilli, between those which are and those which are not Koch's vibrio. Voges† accepts Pfeiffer's conclusions, and recommends that for determining the nature of doubtful cases of cholera, "immunised" guinea-pigs should be kept in readiness, so that serum for testing such cases may be at once forthcoming.

There would be convenience in possessing a final court of appeal of this sort as regards vibrios which, though derived from seeming cholera cases, do not behave in all respects, cultural and other, like Koch's micro-organism.‡ And especially would such tribunal be of advantage in regard of vibrios such as have in various parts of Europe been found inhabiting different water supplies, and which possess greater or less resemblance to the typical cholera vibrio as derived from the intestine of Asiatic cholera. Löffler, Pfuhl, and Weichselbaum hold, for instance, that there are water vibrios which though strongly resembling in biological characters the true cholera vibrio are nevertheless distinct from it, and are altogether innocent pathogenically. Whereas, on the other hand, Sanarelli and Metschnikoff maintain that these water vibrios, or some of them (as, for instance, those found by Sanarelli in various Paris waters) are, as a matter of fact, true cholera vibrios slightly modified by long sojourn in water. But the question is: Can Pfeiffer's serum test be in practice always relied on? In this connexion the following facts are of interest:—

There occurred in Massaouah, in 1891, a series of attacks strongly suspicious of Asiatic cholera. From the rice-water contents of the bowels of the cases in question comma-bacilli were isolated, which, from their cultural characters, and from the chemical reactions of the media in which they had been grown, were declared in Berlin to be cholera vibrios. With these same comma-bacilli Pfeiffer made those first experiments* of his on "Primary cholera poison," and with them also Metschnikoff† made a series of interesting experiments on the human subject; both observers regarding these commas as typical cholera vibrios. Nevertheless the micro-organism obtained from the Massaouah cultures was later on declared by Pfeiffer himself *not to be* Koch's vibrio, for the reason that the serum of his "cholera immunised guinea-pigs" had no germicidal effect on it. By itself this particular conflict of testimony between the old tests and the new one would go for little, provided that Pfeiffer was able to furnish evidence that comma-bacilli derived from a number of different cases which appeared etiologically, chemically, pathologically, and bacteriologically to be true cholera are invariably killed by his serum; along with converse evidence also that comma-bacilli from doubtful cholera cases very commonly are not thus killed. But this he has not done. I find recorded in his paper a few instances only of experiments on vibrios that were derived from cholera cases; and, as it seems to me, he has been always deciding for or against true cholera solely in reference to his serum test, and irrespective altogether of the etiological and clinical histories of the cases in question.‡

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* Zeitschrift für Hygiene. Vol. XVII., part 2, and XVIII., part 1.

† Zeitschrift f. Hygiene, Vol. XVII., part 3.

‡ I have laid stress in my Cholera Report for 1893, published in these volumes, on the fact, first enunciated and observed by Dr. D. D. Cunningham on cases of cholera in India, that vibrios derived from different typical cholera cases are by no means identical in all cultural details.

Be it understood, I accept as a result of Pfeiffer's experiments, and of my own also, the fact that the serum of "cholera-immunised" guinea-pigs has a distinct germicidal action on Koch's vibrio. What I do not accept as equally well proved is the converse proposition, namely, that comma-bacilli which resist the germicidal action of this serum *are not cholera vibrios*; and I decline to accept it as proved on account of the following considerations:—

1. It is now an accepted fact that, from the bowel contents of typical and unquestionable cases of fatal cholera occurring in one and the same outbreak, vibrios may be obtained which exhibit culturally differences sufficing to entitle them to be classed as *varieties* of Koch's cholera microbe; differences, moreover, which I should not be surprised to find correlated with differences in their physiological behaviour when brought in relation with the serum of animals "immunised" by intraperitoneal injection of any one given variety.

2. It is obvious that, unless the amount of serum and the amount of culture of the particular variety of vibrio that is in question be carefully adjusted prior to their injection into the peritoneum of a guinea-pig, the experimental animal may succumb notwithstanding that the vibrio under investigation is really and truly Koch's comma: So that, in regard of each vibrio to be tested, it appears necessary to ascertain, preliminary to testing it, what amount of it constitutes a fatal intraperitoneal dose for the "unprepared" guinea-pig.

Both these considerations will suggest themselves as difficulties to those who have large experience of intraperitoneal injection of bacteria of different sorts or of differing virulence. As regards my own experience, indeed, scarcely any two out of a large number of experiments in intraperitoneal "immunisation" of guinea-pigs for cholera purposes

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* Archiv. für Hygiene. Vol. XIV., part 1.

† Annales de l'Institute Pasteur. 1894.

‡ While this report is passing through the press, I learn, however, that Pfeiffer has since accumulated a considerable amount of positive evidence as to the germicidal effect of the serum of highly immunised animals (guinea-pigs and goats) on a large number of vibrios of different sources, all derived from cases of cholera that had occurred in various parts of Germany and other countries.

App. B. No 4.

On the Antagonisms of Microbes; by Dr. Klein.

gave results exactly alike. Thus, I have found that of a series of guinea-pigs apparently fully protected by antecedent intraperitoneal injection of a cholera vibrio of given pedigree, one or another succumbs at once when injected with a cholera vibrio of different stock, source, or virulence. This I will illustrate from my notes of experiments made in obtaining cholera serum.

Two subcultures on agar of Koch's vibrio were prepared from two typical fatal cholera cases that occurred in Grimsby during the prevalence there of that disease in the autumn of 1893. There was no question that the cases were, alike from clinical, pathological, and bacteriological points of view, true Asiatic cholera. Several guinea-pigs were repeatedly injected intraperitoneally with non-fatal doses of living scrapings from these agar tubes: first, with $\frac{1}{15}$ of a culture tube, then with $\frac{1}{8}$ of a tube, and, finally, with $\frac{1}{5}$ of a tube. All three injections were made in the course of six weeks, at the end of which period the animals appeared quite lively, and their body weight tended to increase. They did not in the least react to the third injection; that is to say, they seemed altogether unaffected by it, although $\frac{1}{5}$ of the same culture killed a control guinea-pig in 20 hours. I now injected several of them, each with an otherwise fatal dose of cholera vibrios from another and typical cholera case that had been recently brought into the Thames. The case in question was an acute one, and the flakes contained in the rice-water fluid of the ileum showed typical cholera vibrios in almost pure culture. Out of four prepared guinea-pigs thus injected with this new cholera culture, two died in 20 hours, as did a control animal; the other two were very ill, but gradually recovered. The post-mortem examination of those that died gave the following interesting results:—Peritoneal cavity contained in each instance fluid exudation and pseudo-membranous flocculi; in the exudation were numerous leucocytes, but no vibrios were recognisable under the microscope. The small intestine was in one animal slightly congested; in the other it was deeply congested and was much distended by fluid sanguineous exudation in which there were numerous epithelial flakes. Under the microscope this fluid, and the flakes contained in it, teemed with comma-bacilli, and by cultivation of these in gelatine plates almost pure cultures of Koch's cholera vibrios were obtained.

In another series of guinea-pigs, similarly prepared by intraperitoneal injection with gradually increasing doses of living cholera vibrios of an undoubted cholera stock, the like result was obtained. Subsequent injection of these animals with living cholera vibrios from another source, showed that though they were protected against vibrios of the first stock yet they succumbed, or at least became very ill, when injected intraperitoneally with an equal dose of cholera vibrios derived from the other different, but unquestionable, cholera stock.

If it be urged that my guinea-pigs had not been sufficiently protected; that if they had been subjected to injection with more virulent vibrios or to a longer course of preparatory treatment, the result might have been different, I answer with Pfeiffer* that if after repeated injections with cholera culture, a given guinea-pig does not, on the occasion of the last injection with more than an otherwise fatal dose, react, or reacts only very slightly, and thereafter regains its body weight, such animal is to be considered "protected." As a matter of fact it is protected against the same stock, though, as has been seen, a considerable number of such guinea-pigs are not sufficiently protected against a different stock of unquestionable cholera vibrios.

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* *Loc. cit.* Vol. XVII., part 2.

For the above reasons I regard the test recommended by Pfeiffer and by Voges as not without difficulties, and as likely, therefore, to lead to erroneous conclusions.

Hitherto I have been assuming that the preparation, in the above way, of guinea-pigs is ordinarily an easy matter. This, however, it is not. For though a majority of experimental animals go on all right after repeated injections with increasing doses, one or the other of them, on a further injection from the same stock, not unfrequently suddenly succumbs. Not a few times have I seen this happen, and I consider the fact of considerable importance, since it materially complicates one's judgment as to the point to which "immunisation" is to be carried in order to be sure that the animals have been brought to the required stage of resistance. In order to make Pfeiffer's test reliable, at any rate to a higher degree than is possible by unqualified acceptance of Pfeiffer's method, it would be necessary to have at one's disposal a considerable number of "prepared" guinea-pigs possessed of undoubtedly high resistance.

With reference to those of my experimentally prepared animals that succumbed after intraperitoneal injection of cholera vibrios from another stock, it will be remembered that while the peritoneum contained, just as in an unprotected animal after the same injection, fluid exudation and pseudo-membranes, the peritoneal fluid did not, as in an unprotected animal, show living vibrios.* In the above animals, therefore, the introduced vibrios did not multiply in the peritoneum but were destroyed there, and the peritonitis must have been caused in some other way. It will be remembered also that these two animals, while both showing on post-mortem examination peritonitis, differed as to the state of the intestine and its contents. As regards one guinea-pig, it appeared likely that the living vibrios injected into the peritoneum had—some of them—been absorbed in a living state into the circulation, and had passed thence into the intestine, where they had multiplied and produced the condition of the intestine actually found. But this did not apply to the other animal, the death of which could not have been due to the state of its intestine, but must have been due in the main to the peritonitis, and the question arises, What caused the peritonitis? Since no living vibrios were found in the peritoneal exudation, the peritonitis could not have been caused by toxins produced there by the injected microbes, and the presumption therefore arises that this animal's peritoneum, though rendered hostile to living bacilli, was not indefinitely protected against the intracellular substance of the vibrios. And if this were the case in the particular instance, the belief commonly entertained that an animal which is protected against toxins of a given microbe is also made proof against the intracellular substance of the same microbe, would appear to be called in question.

A further important indication is seen as arising from the post-mortem examination of the above animals, viz., that an animal's peritoneum may be rendered hostile to living vibrios without its intestine being at the same time in any wise similarly protected. For in one of the two guinea-pigs in question the small intestine was intensely congested, flaccid, and filled with sanguineous fluid, in which were epithelial flocculi teeming with the living vibrios in almost pure culture. A similar condition was also noticed by Pfeiffer in some of his "prepared" guinea-pigs that succumbed to a further intraperitoneal injection of living vibrios, and

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* As has been pointed out in a previous report of mine, if a fatal dose of living cholera vibrios is injected into the peritoneal cavity of a normal guinea-pig, copious multiplication of the microbe takes place within the peritoneum, so that on the death of the animal the exudation there teems with living vibrios.

I myself have seen such condition in two other instances in guinea-pigs belonging to different series, each of which also had been previously subjected to intraperitoneal injection with living cholera vibrios. In these other instances of animals in which the peritoneal cavity proved hostile to the living bacilli (no multiplication of the vibrio occurred within the peritoneum and no living vibrios were obtainable by culture from the peritoneal exudation), the small intestine was nevertheless filled with grumous fluid which contained crowds of living vibrios. It seems quite clear that in these instances living vibrios must have been absorbed (probably they were taken up by the blood vessels) in an early stage, and must have found their way into the cavity of the intestine, where they rapidly multiplied and caused copious effusion of fluid with rapid multiplication of the microbes within it. At any rate there is strong presumption, I think, that though an animal's peritoneum be rendered hostile to living cholera vibrios, it does not follow that thereby the intestine is also protected against them; it may remain capable of furnishing soil for the action and multiplication of the vibrios.

In a previous report I have pointed out that neither Pfeiffer and Wassermann nor I have been able to corroborate Haffkine as to *intestinal* protection obtained by a previous intraperitoneal immunisation. Pfeiffer and Wassermann found that a percentage of guinea-pigs that had been "immunised" by *intraperitoneal* injection of living cholera vibrios succumbed if they were subjected afterwards to *intestinal* injection (after Koch's method) with cholera cultures, their intestine being filled with grumous fluid full of the vibrios. The more recent experiments of mine that I have just been describing serve, therefore, but to emphasise a fact already well established, namely, that there may be produced in guinea pigs peritoneal hostility to the living cholera vibrio without thereby inducing at the same time intestinal protection against the cholera process.

Haffkine's plan of protective inoculation against cholera is based on belief of his that by *subcutaneous* injection of guinea-pigs, first with attenuated then with strong cholera culture, these animals may not only be rendered resistant to *intraperitoneal* injection of fatal doses of the cholera vibrio, but may be at the same time protected against physiological effect of the microbe administered to them *by way of the intestine*. My own experimental observations in this direction do not confirm Haffkine. But whatever the behaviour of the guinea-pig when thus dealt with, there would appear to be little doubt that his more recent procedures in protective inoculation of human beings against cholera, wherein he has been using for *subcutaneous* injection *living* cultures of Koch's vibrio, do, as matter of fact, confer on persons inoculated by him some definite protection against subsequent infection by cholera. And in so far as he has obtained positive results in this sense, I am disposed to attribute them to the circumstance that he uses in each instance for his *secondary* inoculation, living and strong culture of cholera vibrios.

No. 5.

App. B. No. 5.

On Experimental Procedures in Preparation of Prophylactic Blood-serum; by Dr. Klein.

REPORT on certain EXPERIMENTAL PROCEDURES in PREPARATION of BLOOD-SERUM with a view to PROTECTIVE INOCULATION against DIPHTHERIA; by Dr. KLEIN, F.R.S.

Behring was the first to demonstrate that the blood-serum of guinea-pigs artificially "immunised" against diphtheria affords, when subcutaneously injected into other guinea-pigs, protection to these animals against otherwise successful inoculation with diphtheria material.

Later, other observers confirmed this, and the knowledge thus obtained was forthwith utilised in the interest of the human subject attacked by diphtheria.

Behring for a time "immunised" his animals destined to afford blood-serum, by injecting subcutaneously into their areolar tissue sometimes living broth culture of bacillus diphtheriæ, sometimes the toxins elaborated by this microbe. But soon he discarded for his purpose the living bacillus in favour of its toxin; and this procedure has now been universally adopted in the preparation of diphtheria anti-toxin, not only by Behring, but also by Aronson, Roux, and others.

In preparation of blood-serum with the above object, the highly susceptible guinea-pig was soon discarded for animals less susceptible of diphtheria; for it was found that the goat and the horse, which can better withstand repeated injection of steadily increasing amount of diphtheria material, yield blood-serum more suited for the purpose in view.

The *modus operandi* is first of all to inject subcutaneously into the horse, goat, or other animal destined to supply anti-toxic serum, diphtheria toxin (whether pure or weakened by admixture of chemical antagonistic agents) in an amount that is altogether unlikely to be fatal. Such injection produces a temporary local tumour at the site of inoculation, and some slight constitutional disturbance which quickly passes off. After lapse of a few days, and when the animal has completely recovered, it is again subcutaneously injected, this time with a larger amount of the toxin. Again the animal reacts, and, after recovery, is once more injected with further increase of dose; and so the process goes on until the animal, though treated on each occasion of injection to an increased (or more virulent) dose of the toxin, practically ceases to react at all, when it is regarded as sufficiently immune, and its blood-serum as possessed of an anti-toxic potency sufficing for therapeutic purposes. The duration of the process varies in different animals, but commonly occupies in the horse two or three months; and at the end of that period the anti-toxic potency of the prepared animal's blood-serum is tested on the guinea-pig preparatory to its use therapeutically in diphtheria of the human subject.

No blood-serum is considered sufficiently potent for the above purpose unless 0·1 c.c. of it, when injected into a guinea-pig of 300 grammes weight simultaneously with a dose of diphtheria toxin 10 times stronger than would kill the animal in ordinary course, suffices to so far neutralise the toxin injected along with it as to leave the guinea-pig absolutely unharmed. The animal should not exhibit the slightest trace of tumour at the site of injection, nor suffer even temporary indisposition. A serum of this quality is said to possess "one immunising unit" of strength. But serum of this degree of potency is not very serviceable as a remedy in the human subject, owing to the large amount of it necessary to be injected if the diphtheria toxins liberated in a

On Experimental Procedures in Preparation of Prophylactic Blood-serum; by Dr. Klein.

person's body during an attack of that disease are to be fully neutralised: so that few are content with it, and very much stronger anti-toxin is sought after. Behring, for instance, has succeeded in immunising animals so powerfully against diphtheria as to obtain from them blood-serum, 7·5 c.c.* of which comprised 600, 1,000, and even 1,500 units of immunising potency: that is to say, he has produced so potent a serum, that one-six-thousandth, one-ten-thousandth, and even one-fifteen-thousandth of a cubic centimetre of it suffices, when injected along with tenfold a fatal dose of pure diphtheria toxin into a guinea-pig, to completely protect that animal from any resulting malady, local or general.

A high degree of anti-toxic potency is claimed for the blood-serums, prepared by the above method, that are now being offered for adoption as a remedy for diphtheria in this country. Wherefore, with a view of ascertaining how far this claim is justifiable, and for the purpose also of testing the prophylactic, as opposed to the therapeutic value of such serum, certain samples of Behring's, of Aronson's, and of Roux's serum were procured and submitted by me to physiological test.

Tested as to their potency in neutralising diphtheria toxin—as to the property, that is, upon which their therapeutic value depends—these several serums were hardly found to differ; moreover, in this respect their quality appeared to be that claimed for them. But upon testing these several samples of serum with reference to their germicidal potency—*i.e.*, their ability to kill. or at least to inhibit the life processes of, bacillus diphtheriæ—they were all found to be of greatly inferior value, although there was still little to choose between them.

In obtaining the diphtheria bacillus for the purpose of these test experiments, I used certain specially prepared cultures, all of them derived from the same source, but removed by repeated subculture from the original diphtheria membrane. These were gelatine cultures, which for the object in view I found greatly preferable to broth cultures, since they not only possess more uniform virulence, but have the further advantage of furnishing the diphtheria bacilli, *per se*, without admixture of any toxin. The gelatine medium had in each instance been inoculated on its sloping surface in three parallel streaks in a test tube, so as to produce a growth therein measuring 6 centimetres by 2 centimetres, and all the subcultures thus established were incubated at 20·5° to 21·5° C. for 10 to 14 days. Proceeding to use them in experiment, a definite quantity of sterile bouillon was poured into each gelatine tube, and after the diphtheria growth had been carefully scraped off the surface of the nutritive medium, the test tube was shaken up so as to distribute the bacillus growth fairly equally throughout the bouillon that had been added. About one-eighth to one-sixth of such a mixture of bouillon and of bacillus growth from a single culture was used for the inoculation of each guinea-pig, a dose of this amount of living diphtheria bacillus being found, when subcutaneously inoculated into a guinea-pig 500 to 600 grammes in weight, to produce, almost without fail, a typical local œdema with death of the animal in 30 to 36 hours. This amount, therefore, was used as the fatal dose against which to test different quantities of Behring's, of Aronson's, and of Roux's serum.

In detail the results were these:—

0·001 of a cubic centimetre, whether of Behring's, of Aronson's, or of Roux's serum, mixed with one-sixth of the scrapings from the surface of a gelatine culture of the diphtheria bacillus and subcutaneously injected into a guinea-pig of some some 500 grammes weight, was followed always by formation of a local œdema at the site of inoculation, with subsequent death of the experimental animal.

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* The amount of this antitoxic blood-serum which is used for a single injection of the human subject.

0·05 of a cubic centimetre of any one of these serums mixed with the same amount as before of scrapings from a gelatine culture of the diphtheria bacillus, did not prevent the formation of a local tumour in guinea-pigs into which it was injected, though it did prevent a fatal result.

Not until I injected 0·10 of a cubic centimetre of one or other of these serums did I obtain complete protection of the guinea-pig against the above dose of living diphtheria bacilli.

This, of course, signifies that for arresting the operation of a fatal dose of *living diphtheria bacilli* in the guinea-pig there is required as regards any one of these serums, an amount very much greater than that which suffices in the same animal to neutralise a fatal dose of the *chemical products* of this microbe. So that, if we may reason from the guinea-pig to the human subject, there would seem to be required, for securing against diphtheria attack persons (children and nurses) who have been exposed to the infection of this disease, injection of a large quantity of any of these serums. But however this may be, it cannot be denied that the therapeutic value of blood-serum produced in the way above described (page 441) is in no sense testimony to its prophylactic utility, or that a blood-serum of which a more convenient amount can be relied on to protect the human subject against diphtheria attack is not still a desideratum.

In these circumstances, and calling to mind my own experience with regard to the different values of protective inoculations according as the protoplasm (living intracellular substance) or the metabolic products of a microbe are employed, I obtained the Board's assent to certain experiments on the equine animal for the production of prophylactic blood-serum by means of repeated injection with *living culture* (grown in broth, on Agar, and on gelatine) of the diphtheria bacillus, instead of by injection of pure diphtheria toxin. In this way it seemed to me that blood-serum having the required property was most likely to be obtained. Moreover, there appeared at least promise of production concurrently by this method, owing to the life processes of the diphtheria bacillus within the tissues of the horse, of a trustworthy diphtheria anti-toxin with less expenditure of time than by the other methods employed.

Experiment I.; with Pony No. 1.

This was a Russian pony, in very good condition, which had been previously duly tested as to its reaction to mallein. On October 18th, at 5 p.m., its temperature was 38·2° C.

(1.) *On October 19th* there was injected into the subcutaneous tissue of the pony's neck, the total scrapings from a culture of the diphtheria bacillus grown on agar at 37° C. for eight days. In addition there were injected 3 c.c. of a broth culture of the bacillus incubated at 37° C. for eight days. The scrapings from the agar culture were distributed in bouillon, and both fluids were, before injection, sterilised by subjecting them for 15 minutes to a temperature of 60° C.

On October 20th there was much swelling and tenderness at the seat of injection, but the animal fed well; its temperature had risen to 39·5° C.

On October 22nd the swelling had almost disappeared, but the place was still tender; the temperature had fallen to 37° C.

(2.) *On October 23rd* this pony was again injected (temperature before injection, 38·1° C.); with the total scrapings from one agar culture incubated 12 days at 37° C., and with 3 c.c. of broth culture incubated at like temperature for 12 days. Both cultures of the diphtheria bacillus were sterilised at 60° C. before injection.

October 24th.—The seat of inoculation tender; deep seated swelling; temperature, 38·6° C.

October 25th.—Still tender; temperature 38° C.

October 26th.—Slight tenderness; temperature, 37·7° C.

(3.) *October 26th.*—The pony again injected; with the total scrapings from one *living* agar culture of diphtheria bacillus, 12 days old, and with 6 c.c. of broth culture of the organism, 15 days old, which had been sterilised at 60° C.*

October 27th.—Distinct swelling and tenderness about the seat of inoculation; temperature risen to 38·8° C.

October 29th.—No swelling or tenderness; temperature, 38·2° C.

(4.) *October 29th.*—Pony injected again; with the total scrapings from one agar culture of the bacillus, 5 days old, and with 6 c.c. of a broth culture of the microbe, 18 days old. Neither culture was sterilised; living diphtheria bacilli were therefore injected.

October 30th.—Much swelling and great tenderness; temperature, 38·6° C.

October 31st.—Swelling gone down; less tender; temperature, 38·4° C.

November 1st.—Swelling disappeared; no tenderness; temperature, 38·2° C.

(5.) *November 1st.*—Pony again injected; with the total scrapings from one agar culture of the bacillus, 8 days old, and with 12 c.c. of a broth culture, 21 days old. Both samples of the bacillus were in a *living* state.

November 2nd.—Great swelling and tenderness; temperature, 40° C.

November 3rd.—Swelling still but less tenderness; temperature, 38·4° C.

November 4th.—Swelling much gone down; temperature, 38·3° C.

November 5th.—No swelling or tenderness; temperature, 38° C.

November 6th.—No swelling or tenderness; temperature, 38° C.

(6.) *November 7th.*—Pony injected again; with the total scrapings from one agar culture of diphtheria bacillus, 8 days, and with 12 c.c. of broth culture of the microbe, 21 days old; both in *living* state; temperature of pony, 37·6° C.

November 8th.—Large swelling and much tenderness; temperature, 39·4° C.

November 9th.—Still swelling and tenderness; temperature, 38·8° C.

November 10th.—Swelling gone down very much; no tenderness; temperature, 38·4° C.

November 12th.—Slight swelling and tenderness only; temperature, 37·8° C.

November 13th.—Very slight swelling; no tenderness; temperature, 37·9° C.

November 14th.—No swelling; no tenderness; temperature, 38° C.

November 14th.—On this date—26 days from commencement of experiment—the pony was tentatively bled from its external jugular vein; about 650 c.c. of blood being taken. With the serum separated from this blood the following experiments were made:—

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*It should be borne in mind that agar cultures of bacillus diphtheriæ lose in time considerably in virulence; over eight days incubation produces marked attenuation.

(*a.*) A guinea-pig, 534 grammes in weight, was injected with 0·5 c.c. of a *living* broth culture, 48 hours old,* of the diphtheria bacillus, an amount which, in a previous experiment, had produced death in a guinea-pig in 36 hours.

(*b.*) A second guinea-pig, weighing 534 grammes, received 0·1 c.c.† of the pony's serum, and immediately afterwards 0·5 c.c. of broth culture of bacillus diphtheriæ.

(*c.*) A third guinea-pig, weighing 488 grammes, received 0·01 c.c. of the pony's serum, and, immediately afterwards, 0·5 c.c. of broth culture of bacillus diphtheriæ.

(*d.*) A fourth guinea-pig, weighing 467 grammes, received 0·005 c.c. of the pony's serum, and, immediately afterwards, 0·5 c.c. of broth culture of bacillus diphtheriæ.

The control guinea-pig (*a.*) was dead in 36 hours, presenting a conspicuous tumour about the seat of inoculation. Guinea-pigs (*c.*) and (*d.*) had slight tumours; guinea-pig (*b.*) had no tumour. All these animals (*b.*), (*c.*), and (*d.*) were lively and fed readily, and they remained well; the tumours of (*c.*) and (*d.*) gradually disappeared, and had quite gone by the fifth day.

It thus appears that pony No. 1, after being subjected to the immunisation process for not more than 26 days, yielded a serum which completely protected the guinea-pig against a dose of *living* diphtheria broth culture capable of producing a fatal result in a control animal in 36 hours. Of this serum, 0·1 c.c. was sufficient to prevent the formation of local tumour in the experimental animal; and 0·005 c.c. of it was sufficient to prevent death, though insufficient to prevent tumour. With reference, therefore, to body weight, 1 c.c. of the serum of pony No. 1 was found capable of completely inhibiting a dose of living bacilli 10 times stronger than would suffice to kill a guinea-pig weighing 534 grammes—a strength, therefore, of 1 : 5430.

In order to further test the action, at this stage, of the serum of pony No. 1, the experiment was repeated.

(*a.*) A control guinea-pig, 509 grammes in weight, received 0·5 c.c. of *living* broth culture of bacillus diphtheriæ.

(*b.*) A second guinea-pig, 519 grammes in weight, received at the same time 0·1 c.c. of pony serum, and, immediately afterwards, 0·5 c.c. of the above broth culture.

(*c.*) A third guinea-pig, 601 grammes in weight, received 0·05 c.c. of this serum, and, immediately afterwards, 0·5 c.c. of the above broth culture.

(*d.*) A fourth guinea-pig, 407 grammes in weight, received 0·01 c.c. of this serum, and, immediately afterwards, 0·5 c.c. of the above broth culture.

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* In all cases where living broth culture was used in the experiments on guinea pigs it was broth culture incubated 48 hours at 37° C.

† In all these and in succeeding cases of injection of serum, *per se*, the quantity to be used—10 cmm. (0·01 c.c.), 100 cmm. (0·1 c.c.), 5 cmm. (0·005 c.c.), 50 cmm. (0·05 c.c.), or 250 cmm. (0·25 c.c.), as the case might be—was drawn up with an accurately graduated sterile pipette, and then added to 0·5—1 c.c. of sterile salt solution. The mixture of serum and salt solution was drawn up into a sterile hypodermic syringe and injected subcutaneously into the experimental animal immediately before separate injection of the infecting fluid. When the latter was, before injection, mixed with the serum, both together were received into a Pravaz syringe and forthwith injected.

(*e.*) A fifth guinea pig, 495 grammes in weight, received 0·005 c.c. of this serum, and, immediately afterwards, 0·5 c.c. of the above broth culture.

The control animal was dead in 36 hours; guinea-pigs (*c.*), (*d.*), and (*e.*) had local swelling after 48 hours, but otherwise seemed lively and fed well. In these three animals the swelling persisted during the fourth day, and guinea-pig (*e.*) was found dead on the 14th day; the other two were soon quite well. Guinea-pig (*b.*) had not at any time swelling, and remained well throughout.

This result is then a complete confirmation of the previous series of experiments. 0·1 c c. of the serum was capable of completely inhibiting the effects of a fatal dose of living broth culture in a guinea-pig of 519 grammes weight, whereas 0·05 and 0·01 c.c. only incompletely controlled such dose. On the other hand, 0·005 c.c. of the serum did not save the animal from death, although death was delayed until the 14th day; the control animal, which was bigger, succumbed after 36 hours. Taking 0·05 c.c. and 0·01 c.c., respectively, as capable of preserving the life of the animal, we get the following figures:—

1 c.c. serum to 5,190 grammes of guinea pig effects complete inhibition in that animal of the processes of the diphtheria bacillus.

1 c.c. serum to 12,000 and 40,000 grammes of guinea-pig affords only incomplete inhibition of the microbe, although capable of preserving the life of the animals.

These are figures which, I think, show conclusively that the protective potency (germicidal and antitoxic) of the serum of pony No. 1 was, so early as 26 days (see pages 444 and 445) after the commencement of the injection of this animal with living culture, of pronounced character.

Meanwhile pony No. 1, was being subjected to further injection—

(7.) *On November 16th.*—The pony was injected with the total scrapings from one agar tube (*living*) of diphtheria bacillus, 48 hours old; from one agar tube (*living*) 9 days old; and with 10 c.c. broth culture (*living*) four days old. The temperature of the animal was 38·4° C. just before injection.

November 17th.—Slight swelling and tenderness; temperature, 38·4° C.; animal off its feed.

November 19th.—Feeds better; swelling and tenderness have much abated; temperature, 38° C.

November 20th.—Feeds better; swelling still to be felt; temperature, 38° C.

November 21st.—Feeds well; no swelling or tenderness; temperature, 37·8° C.

(8.) *November 22nd.*—The pony injected again; with the scrapings from one agar culture (*living*) two days old, and with those from a gelatine culture (*living*) three weeks old. Temperature of pony immediately before injection, 38·2° C.

November 23rd.—Large swelling and great tenderness; temperature, 39·6° C.

November 24th.—Does not feed well; large swelling; temperature, 38·7° C.

November 26th.—Feeding well; swelling has gone; temperature, 38·2° C.

November 27th.—Feeding well; no swelling or tenderness; temperature, 38° C.

November 28th.—Feeding well; temperature, 38·2° C.

November 29th.—Seems quite normal; temperature, 37° C.

On the latter date—41 days from commencement of experiment—the animal was bled again, 3,600 c.c. of blood being taken from the external jugular vein.

With the serum thus obtained the following experiments were made:—

(*a.*) A guinea-pig, weighing 522 grammes, received (as control animal) 0·5 c.c. of *living* broth culture of diphtheria bacillus, which had been previously tested for its virulence, and with the result that 0·25 c.c. of it was fatal to a guinea-pig of 500 grammes in 36 hours.

(*b.*) A second guinea-pig, weighing 558 grammes, received 0·005 c.c. of the serum, and, immediately afterwards, 0·5 c.c. of the broth culture of diphtheria bacillus.

(*c.*) A third guinea-pig, weighing 573 grammes, received 0·01 c.c. of the serum, and, immediately afterwards, 0·5 c.c. of the broth culture of diphtheria bacillus.

(*d.*) A fourth guinea-pig, weighing 538 grammes, received 0·05 c.c. of the serum, and, immediately afterwards, 0·5 c.c. of the broth culture of diphtheria bacillus.

Next morning, guinea-pigs (*a.*) and (*b.*) had each pronounced local swellings. They were both found dead on the third day; guinea-pig (*a.*) dying in about 30 hours, guinea-pig (*b.*) at about the 50th hour. The other two guinea-pigs remained throughout lively and well, except that guinea-pig (*c.*) had slight local swelling, which had passed off in another two or three days.

So that the serum of pony No. 1 was, at this date, of greater potency than at first. Expressed, as before, in the ratio of 1 c.c. of serum to grammes body weight of guinea-pig, the potency of this serum against living broth culture was as follows:—

1 to 10,000 gave complete protection.

1 to 50,000 gave incomplete protection, but saved the animal from death.

Be it noted that this extra potency of the serum was obtained by further repeated injection of the pony with *living* diphtheria culture to a date 41 days subsequent to the first injection.

The injections of pony No. 1 were afterwards continued with *living* culture of the diphtheria bacillus—

(9.) *On December 6th.*—The animal was injected with the total scrapings from two gelatine cultures; temperature before injection, 37·8° C.

December 7th.—Slight swelling and tenderness; temperature, 39·3° C.

December 8th.—Slight swelling and tenderness; temperature, 38·4° C.

December 10th.—Swelling almost disappeared; temperature, 37·8° C.

December 11th.—Swelling not noticeable; temperature, 37·8° C.

(10.) *December 11th.*—Injected into the pony the scraping of two gelatine tubes, 13 days old, and of and one gelatine tube 18 days old.

December 12th.—Marked swelling; much tenderness; temperature, 40·1° C.

December 13th.—Less swelling and tenderness; temperature, 38·1° C.

December 14th.—Swelling hardly noticeable; no tenderness; temperature, 38·2° C.

December 15th.—No swelling; temperature, 38° C.

(11.) *December 15th.*—Pony injected again; with the total scrapings from two gelatine cultures of the diphtheria bacillus 12 days old.

December 16th.—Marked swelling; temperature, 38 8° C.
December 17th.—Slight swelling; temperature, 38·1° C.
December 18th.—Swelling much gone down; temperature, 37·6° C.
December 19th.—No swelling noticeable; temperature, 38·2° C.
December 20th.—No swelling noticeable; temperature, 38·3° C.
December 22nd.—No swelling noticeable; temperature, 37·7° C.

(12.) *December 22nd.*—Pony further injected; with the total scrapings from two gelatine cultures of the diphtheria bacillus 12 days old.

December 23rd.—Marked swelling; temperature, 39·8° C.
December 24th.—Marked swelling; temperature, 38·3° C.
December 27th.—Still some swelling; temperature, 38·1° C.
December 28th.—Slight swelling only; temperature, 37·9° C.

(13.) *December 28th.*—Pony injected again; with the total scrapings from two gelatine cultures of the diphtheria bacillus 12 days old.

December 29th.—Swelling, but no tenderness; temperature, 38·5° C.
December 31st.—Still some swelling; temperature, 37·8° C.
January 1st.—Swelling gone down; temperature, 37·5° C.
January 2nd.—Scarcely any swelling; temperature, 37·9 C.
January 3rd.—No swelling; temperature, 37·8° C.
January 4th.—No swelling; temperature, 38·2° C.
January 5th.—No swelling; temperature, 37·8° C.
January 7th.—No swelling; temperature, 38° C.
January 8th.—No swelling; temperature, 38° C.
January 12th.—No swelling; temperature, 38° C.

(14.) *January 12th.*—Injected the pony again; with the total scrapings from two gelatine cultures of the diphtheria bacillus 12 days old.

January 13th.—Marked swelling; tenderness; temperature, 38·8° C.
January 14th.—Marked swelling; no tenderness; temperature, 38·2° C.
January 16th.—No swelling; no tenderness; temperature, 38·1° C.
January 17th.—No swelling; no tenderness; temperature, 37·6° C.
January 19th.—No swelling; no tenderness; temperature, 37·8° C.
January 25th.—No swelling; no tenderness; temperature, 37·8° C.
January 26th.—No swelling; no tenderness; temperature, 37·6° C.
January 29th —No swelling; no tenderness; temperature, 38·2° C.

The pony was now—61 days from the commencement of experiment—again bled, and its serum tested against *living bacilli only* on guinea-pigs.

(*a.*) A control guinea-pig was injected with one-tenth of the scrapings from a gelatine culture (*living*) of diphtheria bacillus.

(*b.*) and (*c.*), other two guinea-pigs, each received 0·01 c.c. of the serum, and, immediately afterwards, one-tenth each of the scrapings of the above gelatine culture of diphtheria bacillus.

(*d.*) and (*e.*), two additional guinea-pigs, each received 0·05 c.c. of the serum, and, immediately afterwards, one-tenth each of the scrapings from the above gelatine cultures of diphtheria bacillus.

All five animals were of about the same size, viz., they weighed 280–300 grammes each.

The control animal (*a.*) was found dead in 30 hours. Guinea-pigs (*b.*) and (*c.*) each had a tumour next day; one of them died during the third, the other during the fourth day. Guinea-pigs (*d.*) and (*e.*) had each very slight swelling, but remained otherwise well.

This result was disappointing. It showed that the protective potency of the serum against living culture had not, as was anticipated, increased. Since the pony was bled a second time on 29th November, it had received, between December 6th and January 12th, no less than six injections of living diphtheria bacilli, comprising altogether the total growth from 13 gelatine cultures. Nevertheless, its serum had now an inhibitive potency —in the sense, namely, of preventing death though not preventing local tumour—against the living bacilli no greater than 1 : 6000, as compared with 1 : 50000 on the former occasion.

In order, therefore, to measure its ability to completely inhibit all symptoms, the following experiment was made :—

(*a.*) A control guinea-pig received one-tenth of gelatine culture (*living*) of the diphtheria bacillus.

(*b.*) Other two guinea-pigs each received 0·1 c.c. of the serum, and immediately afterwards a quarter of the scrapings of the gelatine culture of the microbe. The three guinea-pigs weighed from 310–320 grammes each.

The control animal was found dead at the end of 30 hours; the other two had no swelling, and remained normal and well; so that the completely inhibitory potency of this serum was now only about 1 : 3000. And a further comparative test of Behring's, Aronson's, and Roux's serums on the same plan gave the same result, *i.e.*, their protective values against a fatal dose of living diphtheria bacilli from the same stock of gelatine subcultures showed that the completely inhibitory potency of these serums was, as that of my pony at this date, 1 : 3000.

For the rest, the above degree of protective potency of the serum of pony No. 1 was no more than maintained—it did not increase again—after the animal received six further injections of living diphtheria culture; the cultures in question being, all of them, broth cultures incubated at 37° C. for 48 hours. The amount injected on each occasion, and its effect on this pony's temperature, was as follows :—

February 2nd.—5 c.c. ; followed by rise of temperature, 0·2° C.
February 7th.—7·5 c.c. ; followed by rise of temperature, 1° C.
February 13th.—10 c.c. ; followed by rise of temperature, 0·8° C.
February 20th.—10 c.c. ; followed by rise of temperature, 0·4° C.
February 27th.—10 c.c. ; followed by rise of temperature, 0·7° C.
March 5th.—12 c.c. ; followed by rise of temperature, 0·6° C.

Thus, after each injection there was rise of temperature varying between 0·2° (February 2nd) and 1° C. (February 7th). Also there was repetition of local tumour on each occasion.

This pony was killed on March 18th, 150 days from commencement of experiment, and its serum tested for the last time on guinea-pigs against living gelatine culture of the diphtheria bacillus. Its potency was found to be the same as on the previous occasion, viz., for complete inhibition of the diphtheria process, 1 c.c. serum was required for each 3,000 grammes of guinea-pig.

It is thus seen, as a result of this series of experiments, that by repeated injections of a pony with *living* culture of diphtheria bacillus the serum of the pony soon attained definite potency in protecting experimental guinea-pigs against infection with *living* diphtheria bacilli; that this protective potency of the serum was by further injections of the pony increased; but that no sooner was a maximum standard of potency of the serum attained than its potency commenced to decrease again, until it had reverted to a definite level whereat it was maintained by further repeated injections of the pony with the living broth diphtheria culture. But the chief point of interest is the circumstance that, as regards prophylaxis against the *living* diphtheria bacillus, there may—by the method I have adopted—be obtained, *in the short space of* 26 *days*, a serum equally potent with the serums resulting from the Behring, Aronson, and Roux processes, which require a period of 2–3 months for their preparation.

I proceed now to describe a further experiment, in which satisfactory anti-toxic serum was obtained in a horse in an equally short space of time.

Experiment II.; with Horse 4.

This was a large horse in good condition. Injection of it with mallein produced no rise of temperature.

(1.) The first injection of this horse with diphtheria material was made on *October* 30*th*. Its temperature at this date was 37·3° C. As in the case of pony No. 1, the injections were always made into the subcutaneous tissue of the neck. The diphtheria material used consisted of the scrapings from one living agar culture 19 days old, and 9 c.c. of living broth culture of the bacillus, also 19 days old.

October 31st.—Marked swelling about the seat of inoculation; temperature, 37·9° C.; the animal feeding well.
November 1st.—Swelling still considerable and extending; temperature, 37·2° C.; the animal feeding well.
November 2nd.—Swelling decreased very considerably; temperature, 37° C.

(2.) *November 3rd.*—The horse was injected again; with the total scrapings from two agar cultures, and with 12 c.c. of a broth culture of diphtheria bacillus. All cultures were living cultures, and were 23 days old; temperature of horse before injection, 37·2° C.

November 4th.—Marked swelling; feeds well; temperature, 37·5° C.
November 5th.—Marked swelling; feeds well; temperature, 37·6° C.
November 6th.—Some swelling; feeds well; temperature, 37·1° C.
November 7th.—Less swelling; feeds well; temperature, 37·6° C.

(3.) *November 7th.*—On this date horse No. 4 was injected on the other side of the neck; with the scrapings from one living agar culture (8 days old), and with 12 c.c. of living broth culture (8 days old), of the diphtheria bacillus.

November 8th.—Slight swelling; temperature, 37·8° C.
November 9th.—Swelling decreased; temperature, 37·8° C.
November 10th.—No swelling; temperature, 37·4° C.

(4.) *November 10th.*—On this date the horse was again injected; with the scrapings from one agar culture, 48 hours old, and with 12 c.c. of broth culture, 11 days old (both living).

November 11th.—Slight swelling; feeds well; temperature, 38·5° C.
November 12th.—Scarcely any swelling; temperature, 37·4° C.
November 13th.—Scarcely any swelling; temperature, 37·4° C.

App. B. No. 5.

On Experimental Procedures in Preparation of Prophylactic Blood-serum; by Dr. Klein.

(5.) *November 13th.*—The horse was further injected; with the scrapings from two living agar cultures, 3 days old, and with 12 c.c. of living broth culture, 3 days old.

November 14th.—Slight swelling; temperature, 39° C.
November 15th.—Slight swelling; temperature, 38° C.
November 16th.—Scarcely any swelling; temperature, 37° C.
November 17th.—No swelling; feeds well; temperature, 37·2° C.
November 19th.—No swelling; feeds well; temperature, 37° C.
November 20th.—No swelling; feeds well; temperature, 37·2° C.

It is thus seen that horse No. 4 reacted far less to the diphtheria injections than pony No. 1. Though it received from the beginning injection of *living* diphtheria culture, and in far larger quantities than pony No. 1, its reaction was comparatively feeble, and local merely; only at the fifth injection of this horse was there anything like a distinct rise of temperature (1·6° C.) noticeable.* This animal must be considered, therefore, as one possessed initially of a considerable amount of resistance to diphtheria infection.

On 20th November, 21 days from the date of first injection, one litre of blood was taken from the jugular vein of this horse, No. 4, and the serum thereof collected and tested as to its general action against living bacilli and toxin of broth culture on guinea-pigs.

(*a.*) A control guinea-pig received 0·5 c.c. of a broth culture of diphtheria bacillus two days old.

(*b.*) A second guinea-pig received 0·005 c c. of serum of above horse, and, immediately afterwards, 0·5 c.c. of the above broth culture of diphtheria bacillus.

(*c.*) A third guinea-pig, received 0·01 c.c. of serum of the horse, and, immediately afterwards, 0·5 c.c. of the above culture.

(*d.*) A fourth guinea-pig received 0·05 c.c. of serum of the horse, and, immediately afterwards, 0·5 c.c. of the above culture.

(*e.*) A fifth guinea-pig received 0·1 c.c. of serum of the horse, and, immediately afterwards, 0·5 c.c. of the above culture.

All these animals (including the control) were 514–577 grammes each in weight.

The control animal (*a.*) and guinea-pig (*b.*) were found dead in 30 hours; each with a big tumour.

Guinea-pig (*c.*) had a slight swelling next day, and was found dead on the third day.

Guinea-pig (*d.*) had no tumour; there was scarcely any swelling to be noticed, and the animal was lively and fed well; it remained well.

Guinea-pig (*e.*) remained throughout quite normal.

To check this result, the experiment was repeated on a fresh set of guinea-pigs with practically the same experience, viz., 0·1 c.c. serum gave complete protection, while 0·05 c.c. gave, practically, protection, although there was just a trace of swelling noticeable. This swelling was a little more marked in animal (*d.*) of the second set than in that of the first.

This horse, No. 4, then, after only five injections with large doses of living diphtheria culture, administered in the short space of 21 days, furnished serum capable of affording a protection to the guinea-pig against infection with living diphtheria culture parallel with that afforded by serum obtained by Behring, Aronson, and Roux, as the result of repeated injections of diphtheria toxin spread over a very much longer period. And further, this experiment incidentally calls in question Behring's statement that the greater the initial resistance of an animal destined to furnish serum, the longer it takes (*i.e.*, the more numerous the injections required) to confer on its blood an antitoxic potency. For, as has been seen, the serum of the horse now in question possessed, 21 days from the date of initial injection, great potency, although the resistance of the animal was from the first considerably higher than that of pony No 1. The reaction produced by the first injection in pony No. 1 was incomparably greater than in horse No. 4; moreover, pony No. 1 was subjected, as matter of first instance, to a small dose of *sterile* diphtheria culture, whereas this horse was subjected from the beginning to injection of a large dose of virulent *living* culture.

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* Neither in this horse nor in pony No. 1 were local abscesses produced at any time.

EXPERIMENT III.; WITH RUSSIAN PONY No. 2.

This pony was, antecedent to experiment, in good condition; its temperature was 37·8° C. It had not reacted to mallein.

(1.) It was injected on *October 30th;* with the scrapings from one living agar culture of the diphtheria bacillus, 19 days old, and with 9 c.c. of living broth culture of the microbe, also 19 days old.

October 31st.—The pony very weak on its legs—cannot stand; does not feed at all; respiration very rapid; temperature, 39·6° C. A large tumour at seat of inoculation. [The animal was not expected to live through the night.]

November 1st.—The animal still weak, but can stand on its legs; does not feed; respiration better; temperature, 39·5° C. Tumour still marked.

November 2nd.—Swelling at seat of inoculation gone down a little breathing all right again; feeds a little; temperature, 39° C.

November 3rd.—Swelling has spread over neck and shoulder; the animal feeds well and is decidedly improved; temperature, 38·4° C.

November 4th.—Swelling has not further spread; temperature, 38·3° C. It feeds well and is again strong on its legs.

November 5th.—Swelling has not further increased; temperature, 37·4° C.; feeds well.

November 6th.—Swelling remains; temperature, 37·6° C.; feeds well.

November 7th.—Swelling remains; temperature, 37·6° C.; feeds well.

November 8th.—Swelling decreasing; temperature, 37·4° C.; feeds well.

November 9th.—Swelling decreasing; temperature, 37·6° C.; feeds well.

November 10th.—Swelling almost gone; temperature, 37·6° C.; feeds well.

November 12th.—Swelling disappeared; temperature, 38° C.; feeds well.

November 13th.—No swelling; temperature, 37·4° C.; feeds well.

November 14th.—No swelling; temperature, 37·8° C.; feeds well.

(2.) *November 14th.*—On this date the pony was again injected; with the scrapings from two living agar cultures of diphtheria bacillus a month old, and with 8 c.c. of living broth culture of the microbe, 15 days old.

November 15th.—Marked swelling; temperature, 39·6° C.
November 16th.—Swelling still large; temperature, 38·2° C.
November 17th.—Swelling extending; temperature, 38° C.
November 19th.—Swelling no longer extending, but still large; temperature, 37·4° C.
November 20th.—Swelling not extending, but still large; temperature, 38° C.
November 21st.—Swelling decreased; temperature, 37·4° C.
November 22nd.—Swelling further decreased; temperature, 37·4° C.

(3.) *November 22nd.*—This pony was injected on the other side of its neck; with the scrapings from two living agar cultures of diphtheria bacillus 6 days old.

November 23rd.—Large swelling; pony not feeding well; temperature, 39° C.
November 24th.—Large swelling; not feeding well; temperature, 38·2° C.
November 26th.—Neck still swollen; feeds all right; temperature, 37·6° C.

(4.) *November 26th.*—The pony injected again; with the scrapings from one living agar culture 2 days old, and with the scrapings from one living agar culture of diphtheria bacillus 6 days old.

November 27th.—Pony off its feed; marked swelling; temperature, 38° C.
November 28th.—Feeding well; swelling still considerable; temperature, 37·8° C.
November 29th.—Feeding well; soft swelling extending to lower part of neck; temperature, 37·2° C.
November 30th.—Feeding well; swelling going down; temperature, 37·6° C.
December 1st.—Feeding well; swelling slight; temperature, 37·6° C.
December 3rd.—Feeding well; swelling slight; temperature, 37·2° C.
December 4th.—Feeding well; swelling slight; temperature, 37·7° C.
December 5th.—Feeding well; swelling slight; temperature, 37·8° C.
December 6th.—Feeding well; swelling still slight; temperature, 37·6° C.
December 7th.—Feeding well; swelling still slight; temperature, 37·6° C.
December 10th.—Feeding well; swelling almost gone; temperature, 37·6° C.
December 12th.—Feeding well; no swelling noticeable; temperature, 37·8° C.
December 14th.—Feeding well; no swelling noticeable; temperature, 37·8° C.
December 15th.—Feeding well; no swelling noticeable; temperature, 37·9° C.

(5.) *December 15th.*—The pony was further injected with the scrapings from two gelatine cultures of diphtheria bacillus, 12 days old.

November 17th.—Slight swelling; temperature, 38·2° C.
November 18th.—Swelling larger; temperature, 37·4° C.

This animal was further injected on December 22nd, December 28th, January 5th, 12th, February 2nd, 7th, and 13th. On each occasion it received the scrapings from two gelatine cultures of diphtheria bacillus, 12 days old. On February 7th and 13th it received, in addition, 10 c.c. of living broth culture of diphtheria bacillus 48 hours old. On each occasion there was, the day after injection, marked swelling, which gradually disappeared; and on each occasion also the temperature was, the day after injection, found to be raised, thus:—

December 23rd, by 2° C.
December 29th, by 0·4° C.
January 6th, by 2·2° C.
January 13th, by 1·4° C.
February 3rd, by 0·4° C.
February 8th, by 1·2° C.
February 14th, by 1·4° C.

So that this animal exhibited at the very first, on October 30th, a low resistance; and subsequently, till February, continued to exhibit a low resistance, 12 injections having meanwhile been made. It did not indeed seem in mid February much better able than at first to resist diphtheria material of similar quality and quantity. As might be expected in the circumstances, its serum did not prove a success.

The animal was killed on March 2nd, three months, that is, after commencement of treatment, and its serum, when tested on guinea-pigs against the living diphtheria bacillus, was found to be possessed of but slight germicidal power. Thus, 0·1 c.c. of this serum was not capable of preventing the formation of tumour in a guinea-pig injected immediately afterwards with an otherwise fatal dose of living diphtheria culture; the animal, however, survived. Pony No. 2, therefore, was ill-suited for the rapid production of germicidal serum. Comparing, indeed, the three experimental animals in this respect, it would appear that pony No. 2 had not only the higher initial susceptibility, but also a susceptibility which decreased only very slightly during the three months it was under preparatory treatment. In a word, it took a good deal longer to form the germicidal substances in its blood, and these were formed there in much smaller amount or strength than in pony No. 1 and in horse No. 4.

It remains to be mentioned that the serum obtained in these experiments, and duly tested, as has been shown, on guinea-pigs, has been extensively used therapeutically on the human subject in different hospitals, and with very good results.

No. 6.

APP. B. No. 6.

On the Etiology of Influenza Cold; by Dr. Cautley.

FURTHER REPORT on the ETIOLOGY of "INFLUENZA COLD"; by EDMUND CAUTLEY, M.D.

In my report last year I referred to various observations by Von Besser, J. Wright, and Paulsen on the micro-organisms to be detected in normal nasal secretion. These observers found a large variety present, including such common organisms as staphylococcus pyogenes aureus, citreus, and albus; micrococcus liquefaciens albus; micrococcus albus; micrococcus flavus liquefaciens; penicillium glaucum; streptococcus pyogenes; diplococcus pneumoniæ; and several others.

Observations on acute nasal catarrh by Hajek, Paulsen, and E. Fränkel were also referred to. In the nasal secretion of persons thus affected it was also found that cocci, more especially the staphylococcus pyogenes aureus, were the most common organisms.

My own results, obtained from the examination of the nasal secretion of persons suffering from acute febrile nasal and naso-pharyngeal catarrh, were analogous to those of the above-mentioned observers. No organism was found constantly or even commonly present, and in only two out of the ten cases investigated by me was any organism present in anything like pure culture. In one of these cases a large number of colonies of a micrococcus, slowly liquefying gelatin, was present. It proved to be the micrococcus liquefaciens albus. In the other case streptococcus pyogenes longus was present in almost pure culture. In this case the nasal secretion was not examined until the fourth day of the attack, at a time when it was profuse and mucoid in character and contained some muco-pus. From the remaining 8 cases a large variety of colonies were obtained, consisting of staphylococci, moulds, and sarcinæ.

It is noteworthy that so far no bacilli had been found in the nasal secretion of acute febrile catarrh in larger numbers than might be accounted for by accidental contamination.

In continuation of my work on this subject, eight other cases of acute febrile catarrh have been dealt with. Most of them were identical clinically with the affection that goes by the name of "influenza cold."

The investigation has been carried out on the same lines as were previously adopted. Selecting those cases in which the onset of the attack was more or less acute, and accompanied (to judge from the patient's story) by a certain degree of fever, the nasal secretion was examined at as early a date as possible after the commencement of illness. Taking into consideration that a certain number of microbes are always present in the atmospheric air and so gain access to the nasal passages on inspiration, subcultures were only made from colonies which were so far numerous in the medium directly inoculated with nasal secretion as to indicate that the organisms were not contaminations, at any rate not recent ones.

Case I.

App. B. No. 6.

On the Etiology of Influenza Cold; by Dr. Cautley.

History of Illness.—A male, aged 23. Caught cold March 1st, 1895; in the evening felt feverish and "seedy." Next day: general malaise, "stuffiness," and frontal headache; temperature normal. At this date there was scanty, viscid, mucoid discharge from the nose. The subsequent course of the illness took the form of a "cold" in the head, extending down the trachea, with fever; temperature, 104° F. The patient, a qualified medical man, was under the impression that he had epidemic influenza.

Mode of Examination.—The mucoid secretion was examined on two occasions; firstly 18 hours, and on the second occasion 62 hours, after the initial symptoms.

First Investigation.—The patient discharged, 18 hours after attack, a small quantity of nasal secretion into a sterilized watch-glass. Portions of this were smeared freely over the surface of the medium in three *gelatin* and two *agar-agar* tubes, which were then placed in an incubator at 20° C.; and over that of the medium in other two *agar-agar* tubes, which were incubated at 37° C. Fresh and stained cover-glass specimens of the secretion were prepared and examined.

Microscopical Characters of the Secretion.—A large number of leucocytes, a few squamous cells, and various microbes were present. None of the microbes showed any motility. One of the squamous cells appeared to contain a group of seven small bacilli. A few cocci, arranged as tetrads, probably sarcinæ, and a few large diplococci were present. The most abundant organism was a short oval bacillus, arranged in small groups; showing in particular instances marked transverse segmentation, so much so as to resemble a diplococcus. Similar bacilli were found solitary, and a few were arranged in pairs placed end to end. Hence the only organism at all plentiful was a peculiar oval, segmented, non-motile bacillus; but even this was not present in very large numbers.

Examination of Cultures.—The *gelatin* cultures incubated at 20° C. remained sterile at the end of a week, and were then discarded.

Of the two *agar-agar* cultures incubated at 20° C. one remained sterile at the end of a week; but the other showed a considerable number of minute, almost transparent, colonies closely resembling the culture medium in colour. These colonies occurred in pure culture, no other growth being present, either then or subsequently. Subcultures of these on *agar-agar* at 37° C. formed in 24 hours a delicate streak of almost transparent colonies, with scanty deposit in the condensation fluid. The organism forming these colonies proved identical with that presently to be described as organism B.

The two *agar-agar* cultures incubated at 37° C. exhibited in 48 hours numerous colonies, chiefly of two kinds (A. and B.).

A. Large white smooth colonies; eight only in the two tubes.

B. Small, round, and greyish-white colonies. At the end of four days these had become a little larger and whiter; but, even when quite isolated from others, they never grew bigger than a small pin-head. These were far more numerous than the large white colonies; so that if this person's illness was due to microbial infection, they probably represent the exciting cause.

Biological Characters of Organism A.—Subcultures on the surface of *gelatin* incubated at 20° C. developed a very delicate streak of minute colonies in 48 hours. This became greyish-white in a week; and the medium was not liquefied. In *gelatin* stab cultures small white colonies developed along the line of inoculation; no surface expansion formed. *Gelatin* cultures incubated at 37° C. showed in two days a general turbidity, with flocculent white deposit, and considerable stringy growth on and near the surface.

On *agar-agar* at 37° C. a flat, white, smeary, paint-like, profuse, coherent growth developed in 48 hours along the line of inoculation, and scanty deposit occurred in the condensation fluid.

Broth incubated at 37° C. became intensely turbid, with scanty deposit in two days. The deposit remained moderate in amount, and became white and stringy. In *broth* incubated at 20° C. similar growth took place, but more slowly. The broth remained odourless. On *gelatin* subcultures made from the broth, isolated colonies occurred; they were small, raised, and greyish-white; and they caused no liquefaction of the medium, even at the end of six weeks.

Microscopically, this organism is a small micrococcus, arranged as a diplococcus and occurring also in small groups.

Biological Characters of Organism B.—*Gelatin* streak subcultures incubated at 20° C. grew very slowly; not until five days had elapsed was growth visible in the form of a streak of very minute transparent colonies. Even at the end of a month the growth was very scanty, and separate colonies were small, round, and greyish-white. *Gelatin* stab cultures showed along the puncture, in four days, a delicate greyish-white line composed of minute round colonies. No surface expansion formed. *Gelatin* cultures at 37° C. showed slight turbidity at the end of 24 hours and persisting for five days. The growth did not resemble that of the diplococcus pneumoniæ (see Plate V.).

On *agar-agar*, at 37° C., a delicate streak of minute, almost transparent, colonies, developed in 24 hours, with scanty deposit in the condensation fluid. A growth of longer duration became slightly greyish-white. Isolated colonies remained small and round, eventually becoming fringed at the edges (see Plate IV., Figs. 10 and 11).

Broth incubated at 37° C. remained clear at the end of two days, but yielded a scanty stringy white deposit.

Microscopically, cover-glass preparations from gelatin cultures showed short oval bacilli, and forms like diplococci. Similar forms were found in the agar-agar and the broth cultures, as also some club-like forms. The organism is therefore a small, oval, non-motile bacillus, with a pronounced tendency to segregation of the protoplasm. From the fact that this bacillus was present in this and six other cases out of the eight examined, I have named it the *Bacillus coryzæ segmentosus* (see Plate III., Fig. 6).

In addition to these two organisms (A and B) another bacillus (Organism C.) was obtained from the original *agar-agar* cultures. It was only present in small numbers. It formed fluffy white colonies on *gelatin*, a free white growth on *agar-agar*, and much turbidity and deposit in *broth*. Microscopically, it is a small, regular, non-motile, with rounded ends; and it does not form chains.

Second Investigation.—On the fourth day of the illness of Case I., 62 hours after the first symptoms, the nasal secretion was more profuse and slightly muco-purulent. It was tested in two gelatin tubes incubated at

20° C., and in two *agar-agar* tubes incubated at 37° C. The mode of inoculation of the culture media differed from that adopted in the first investigation: a platinum needle, with a small loop at the end, was sterilized, and the loop was introduced into the anterior nares for about an inch, care being taken to avoid touching the tissues round the orifice. The loop was next pressed gently against the mucous membrane of the septum, or of the inferior turbinate bone, was then withdrawn, and freely rubbed over the surface of the culture medium.

Examination of Gelatin Cultures.—A few small colonies developed on the surface in each tube in five days. Subcultures from these also on gelatin showed, in five days, a delicate streak of similar minute transparent colonies. Subcultures thereof on *agar-agar* and in *broth*, incubated at 37° C., proved the organism to be that which was obtained from the *agar-agar* cultures in the first investigation, namely, the *bacillus coryzæ segmentosus*, or Organism B.

Examination of Agar-Agar Cultures.—In the two tubes incubated at 37° C. for two days, some 200 to 300 isolated small, raised, round, greyish-white colonies developed. The cultivations were not, however, absolutely pure; there were also a few larger white colonies, which resembled in appearance colonies obtained in the first investigation, and proved, on cultural and microscopical examination, to be what has been already referred to as organism A. The main or predominating organism, however, proved to be identical with organism B., as above described.

Results as to Case I.—Two organisms were obtained both on the second and fourth day of the illness. The predominating organism was a bacillus, which I have named *bacillus coryzæ segmentosus;* it was found in large numbers, especially in the later stage of the attack, when it occurred in almost pure cultivation.

Case II.

History of Illness.—A male, aged 36, began to be ill, March 3rd, 1895, with laryngitis and tracheitis. Two days later the congestion of the mucous membrane extended upwards to the naso-pharynx and the nose; a watery discharge began to issue from the anterior nares, and the patient had a little frontal headache. The same night, and on the following morning when the samples of nasal secretion were taken for cultivations, the patient's nose felt, he said, stuffed up. The subsequent course of the case was that common in acute coryza.

Mode of Examination.—Nasal secretion taken direct from the mucous membrane, after the manner adopted in the second investigation of Case I., was used for inoculation of two *gelatin* tubes which were incubated at 20° C., and of two *agar-agar* and of one *glycerine-agar* tubes, which were incubated at 37° C.

Examination of Gelatin Cultures.—No colonies were visible at the end of two days. At the end of seven days, 23 colonies, small, round, flat, and white, were present in the two tubes; all, except two, of the 23 were of like sort, and showed commencing liquefaction. In addition there were numerous very small transparent colonies, which proved to consist of organism B., to be presently described.

App. B. No. 6.

On the Etiology of Influenza Cold; by Dr. Cautley.

Examination of Agar-Agar Cultures.—These showed, at the end of 24 hours, two kinds of colonies, to be described as A. and B.

A. Numerous round, raised, smooth, white colonies, about $\frac{1}{10}$ inch in diameter; increasing later in size to $\frac{1}{8}$–$\frac{1}{3}$ inch diameter.

B. A considerable number of very minute, almost transparent, colonies; more numerous than the larger white ones.

Biological Characters of Organism A.—On *gelatin* plates incubated at 20° C. the colonies developed slowly, were round, smooth, and white. The gelatin began to liquefy in seven days, and at the end of 10 days showed small circular pits, with clear cut edges and a small white granular mass at the bottom of each. *Gelatin* streak subcultures showed, at the end of two days, a white growth along the line of inoculation. The growth increased a little in thickness, and became whiter, but did not spread over the surface; it remained coherent, and, liquefaction commencing in six days beneath it and at its edges, it gradually sank below the surface of the gelatin as into a furrow. In *gelatin* stab cultures, growth commenced, in 24 hours, along the line of inoculation in the form of small round colonies; no surface expansion. Liquefaction began, in six days, near the surface, and gradually extended downwards, with extreme slowness, along the line of growth. Even at the end of two months liquefaction was very scanty.

On *agar-agar* incubated at 37° C., a smooth, thick, raised, white growth developed, in 24 hours, along the line of inoculation, with scanty deposit in the condensation fluid.

Broth incubated at 37° C. became densely turbid in 24 hours, with scanty deposit. The deposit increased in amount and became white. At 20° C. the same appearances were developed in broth, though more slowly.

Microscopically, the organism was found to be a small coccus, arranged as diplococci and occurring in small groups. It appears to be identical with the *Micrococcus liquefaciens tardus*, so called on account of the slowness with which it liquefies gelatin. This is a not uncommon skin contamination.

Biological Characters of Organism B.—*Gelatin* streak subcultures, incubated at 20° C., showed minute colonies in 24 hours, and, in two days, a delicate transparent streak along the line of inoculation. *Stab cultures* grew slowly and formed a delicate greyish-white streak along the line of puncture, composed of minute round colonies; no surface expansion. On *gelatin* isolated colonies remained at the end of two weeks very small and almost transparent; eventually they became greyish-white (see Plate V., Figs. 14 and 15).

On *agar-agar* incubated at 37° C. a delicate, almost transparent, growth developed in 24 hours, with scanty deposit in the condensation fluid. The growth was composed of small clear colonies, which became greyish-white in a few days. Isolated colonies remained small and round, or fringed.

Broth incubated at 37° C. for two days, was clear with scanty stringy white deposit.

Microscopically, the organism proved a small oval bacillus, some of the rods exhibiting marked segregation of the protoplasm. Also it exhibited club-shaped and coccus-like forms. It was non-motile. This organism resembled, culturally and microscopically, organism B. found in Case I., namely, the *Bacillus coryzæ segmentosus.*

Examination of nasal secretion by Glycerine Agar Culture.—At the end of 48 hours this tube yielded 15 white colonies which proved to be formed by organism A., and a large number of small round colonies which proved on culture and microscopical examination to be formed by organism B.

Results as to Case II.—Two organisms in considerable numbers: *Bacillus coryzæ segmentosus*, which was greatly predominant, and the *Micrococcus liquefaciens tardus.*

Case III.

History of Illness.—A male, aged 20, noted, March 7th, 1895, a feeling of chilliness at noon; "stuffiness" about the nose and frontal headache came on during the afternoon and evening; a feeling of chilliness was again experienced several times during the evening. There was increase of the "stuffiness" during the night, and scanty tenacious discharge on the following morning; also general malaise and frontal headache.

Mode of Examination.—Cultivations of the naval secretion were made in three *agar-agar* tubes and three *gelatin* tubes at mid-day, 24 hours after the onset of the attack. These tubes were inoculated by means of the loop of a sterilized platinum needle, which, having been pressed gently against the mucous membrane of the nose, about one inch from the anterior nares, was then rubbed freely over the culture medium. The *gelatin* cultures were incubated at 20° C., and the *agar-agar* cultures at 37° C.

Examination of Gelatin Cultures.—In one, numerous, very minute, almost transparent colonies were visible at the end of 24 hours (Organism A.). In addition there were other colonies of several different kinds: none of them numerous and not therefore studied biologically, being regarded as unimportant. They included two moulds, one colony of sarcina lutea, and three raised white colonies of diverse sorts. In the other two gelatin tubes a moderate number of colonies of the first kind (Organism A.) were found, together with a few larger white ones.

Biological Characters of Organism A.—On *gelatin* plates, incubated at 20° C., minute transparent colonies developed slowly, in three to five days. Streak cultures on *gelatin* formed in two days a very delicate streak of almost transparent colonies, which remained practically unaltered in appearance at the end of three weeks. Stab cultures in *gelatin* showed a faint greyish white streak along the line of inoculation, but no surface expansion.

On *agar-agar* incubated at 37° C., a delicate growth of minute almost transparent colonies formed in 24 hours, with scanty deposit in the condensation fluid. The growth became greyish-white in five days. Separate colonies on *agar-agar* plates were smooth, raised, round, small, and greyish-white.

Broth incubated at 37° C. became faintly turbid in two days, and showed a scanty, stringy, whitish deposit. At the end of a week the broth was quite clear except for the deposit, which was still scanty and stringy.

Microscopically, the gelatin and agar-agar cultures showed oval bacilli. Many club-like forms were also found in cultures of two days' growth. Segregation of the protoplasm was extremely marked, so much so as to give to the micro-organisms the appearance of cocci. Broth cultures showed similar forms, the coccus form being even more prominent; also a few small clumps, but no chains.

Examination of Agar-Agar Cultures.—One tube was almost covered with a growth of *bacillus mesentericus.* The other two agar tubes yielded three varieties of colonies in moderate numbers, and also a few isolated colonies of various kinds. Of the three main varieties (A., B., C.), one (A.) was much more numerous than the other two, and proved, on cultivation, to be identical with the organism (A.), obtained from the *gelatin* cultures.

Biological Characteristics of Organism B.—Fourteen colonies of this organism were developed in the above two *agar-agar* cultures. Separate colonies on the *agar-agar* had at the end of two weeks a raised round yellow nucleus-like centre, and a surrounding white zone with irregular edges.

On subculture in *gelatin* plates, separate colonies were small, round, and white, and at the end of 18 days resembled oyster patties in shape. A faint streak of growth appeared in *gelatin* stab cultures, without surface expansion. Subcultures on *gelatin* formed in two days a delicate greyish-white streak, which became slowly thicker and whiter.

On *agar-agar* incubated at 37° C., a thick white streak developed in two days, and in eight days the central portion acquired a delicate pale yellow tint.

Broth incubated at 37° C., became very turbid in two days, with much white deposit.

Microscopically, this organism proved to be a non-motile bacillus with rounded ends, growing in small clumps, not forming chains or threads, and showing marked transverse irregular segmentation of its protoplasm. There were also club-shaped forms.

Biological Characters of Organism C.—A moderate number of colonies of this organism were obtained from the original *agar-agar* cultures; they were, however, less numerous than the colonies of either of the other organisms.

On *gelatin* streak subcultures, a thick, narrow, raised white growth developed in the course of from three to five days; it was composed of round raised smooth white colonies. *Gelatin* stab cultures showed a delicate streak along the line of puncture, composed of minute, round, white colonies, with a small raised white knobby expansion on the surface.

On *agar-agar* incubated at 37° C., a raised white growth developed in two days, with scanty deposit in the condensation fluid.

Broth incubated at 37° C., became turbid in two days; a scanty deposit slowly settled, which even at the end of three weeks was only moderate in amount and dust-like in character: meanwhile the supernatant fluid had become clear.

Microscopical examination of the growth from *broth* and *agar-agar* cultures showed short oval bacilli with bi-polar staining; some short chains. Also forms which looked liked diplococci.

Results as to Case III.—Three organisms: (A.), the most numerous and identical with the *bacillus coryzæ segmentosus* of the first two cases; (B.), a bacillus somewhat similar in microscopical appearances, but differing biologically; and (C.), a bi-polar bacillus forming chains.

CASE IV.

History of Illness.—A male, aged 30, got wet on March 9th, 1895, and felt a little chilly at night. He suffered considerable lassitude and debility on the following day, and a feeling of "stuffiness" in the nose.

On March 11th, discharge from the nose commenced; it was scanty and viscid. General malaise meanwhile increased, and there was some frontal headache. The catarrh appeared to be most marked in the posterior nares, and the exudation therefrom was slightly muco-purulent. On March 12th the patient still suffered from general malaise; the characters of the nasal catarrh remained the same, with the exception that the exudation was not so viscid. The course of the affection, subsequent to this date, was that of an ordinary severe cold in the head.

Mode of Examination.—On March 12th two *agar-agar* cultures were made by taking from the mucous membrane of the anterior nares a minute trace of the watery secretion on a sterilized platinum needle, and rubbing it freely over the surface of the culture media; the test tubes being then placed in an incubator at 37° C. Two *gelatin* surface cultures were prepared in a similar way, and placed in an incubator at 20° C.

Similar cultures were made from a portion of the muco-purulent secretion of the posterior nares. This secretion which was hawked up through the mouth, was thoroughly washed in boiled salt solution before the cultures were made.

Microscopical Examination of specimens of the secretion of the posterior nares, stained in gentian violet or methyl blue, showed cocci almost in pure culture. These cocci were arranged chiefly as diplococci; there were also a few short chains, composed of four elements, and some small groups of the cocci. In addition, a few larger cocci and sarcinæ, and a few bacilli of various shapes and sizes, were found. None of the organisms appeared to be capsulated. Many leucocytes were found crowded with micro-organisms, and a few eosino-phil cells were present.

Examination of the Gelatin Cultures.—In two days the *gelatin* in the tubes inoculated with secretion from the posterior nares was covered with a large number of isolated, minute, almost transparent, colonies. Under a low power of the microscope these colonies had the appearance of minute, round, clear drops of water. In seven days they became greyish-white in colour, but still remained small, round, raised, and isolated. The cultures were practically pure. The *gelatin* in the tubes inoculated with secretion from the anterior nares showed a few similar colonies. Subcultures from several of these small colonies were made on *agar-agar*, and incubated at 37° C. In two days these subcultures showed numerous minute greyish-white colonies, with scanty flocculent deposit in the condensation fluid: microscopically, they were found to consist of cocci forming long chains; the coccus being identical with the organism (B.) about to be described, namely, that known as *streptococcus longus*.

Examination of the Original Agar-Agar Cultures.—In 24 hours the *agar* tubes inoculated with secretion from the posterior nares showed a large number of colonies of two kinds:—

A. About 50–70 colonies (in each tube), round, white, smooth, and raised.

B. A very large number of minute greyish-white colonies.

The *agar* tubes inoculated with secretion from the anterior nares showed a considerable number of similar colonies to those obtained from the posterior nasal secretion. They were, however, much less numerous.

Biological Character of Organism A.—On *gelatin* streak cultures a growth was visible along the line of inoculation at the end of 24 hours; it increased slowly, and was composed of raised, round, white colonies. At the end of 7 to 10 days liquefaction commenced in the gelatin, and proceeded with extreme slowness. In *gelatin* stab cultures a growth of small, round, white colonies formed along the line of inoculation; liquefaction commenced at the end of 7 to 10 days, as was seen by the slight depression at the point of inoculation; it proceeded even more slowly than in surface cultures. No surface expansion formed round the point of inoculation. On *gelatin* plates small round white colonies formed, and, as the gelatin slowly liquefied, little clear-cut pits were formed, and the colonies sank to the bottom of them.

On *agar-agar*, incubated at 37° C., a profuse, raised, waxy, white growth developed in 24 hours; the condensation fluid became turbid, with a scanty dust-like deposit, which became flocculent in three days.

Broth, at 37° C., showed dense turbidity in 24 hours, with scanty white deposit: in seven days the deposit was coherent and stringy, and the supernatant fluid densely turbid.

Microscopically, this organism proved to be a small coccus, arranged as diplococci and occurring in small groups.

This is the same organism as Organism A. in Case II. and identified as *Micrococcus liquefaciens tardus.*

Biological Character of Organism B.—On *gelatin* plates at 20° C., minute, clear colonies, like drops of water, formed in two days, and slowly assumed a greyish-white tint. In *gelatin* streak culture a delicate, almost transparent, growth formed in 24 hours along the line of inoculation, and slowly assumed a greyish-white tint. Stab cultures in *gelatin* showed a delicate whitish streak of minute colonies along the line of inoculation, without surface growth.

On *agar-agar* incubated at 37° C., a free growth of almost transparent colonies formed in 24 hours along the line of inoculation, with scanty flocculent deposit in the condensation fluid.

Broth incubated at 37° C. became slightly turbid in 24 hours, with considerable white deposit. At the end of a week the deposit was flocculent in character, and the supernatant fluid clear.

Microscopically, the organism of the broth cultures and of the condensation fluid of the agar-agar cultures, proved to be a coccus arranged in long chains.

Results as to Case IV.—Two organisms were present; the one, *Streptococcus longus* (B.) so abundantly as, in some tubes, to form pure cultures; the other (A.) being a harmless skin contamination, *Micrococcus liquefaciens tardus.*

CASE V.

History of Illness—A male, aged 33, a waterside labourer, found, on waking in the morning, April 14th, 1895, that he had running from the nose and eyes, and that his throat felt a little sore. During the day he frequently had slight shivering attacks, felt feverish, and suffered from frontal headache and "stuffiness" of the nose. During the following night he slept badly on account of the stuffiness interfering with his breathing. Next morning, when he came under observation, his appearance was typically that of a man with a severe influenza cold. He had a dirty brown tongue, suffusion of the conjunctivæ, and running from the nose and eyes. His throat exhibited a little pharyngeal catarrh. His pulse was very soft and markedly dicrotic. Temperature in the mouth was 99° F. No history of exposure to wet or cold could be obtained.

Mode of Examination.—Three *agar-agar* tubes and three *gelatin* tubes were inoculated direct from his mucous membrane. Two of *agar-agar* and one of *gelatin* were inoculated with a portion of nasal secretion blown by the patient into a sterilized watch-glass.

Character of Secretion.—Cover-glass preparations of the *nasal secretion* showed a practically pure culture of a small bacillus in groups and pairs placed end to end. Some of the bacilli showed marked bi-polar staining; diplococcus-like forms were also present and many leucocytes (see Plate I.).

The secretion which was mucoid in character, slightly tinged yellow in parts, yielded on cultivation:—

(i.) Three colonies of *staphylococcus pyogenes aureus.*
(ii.) Many colonies of *bacillus coryzæ segmentosus.*
(iii.) A number of colonies of an organism presently to be described as (*d.*).

Examination of the culture tubes inoculated with scrapings from the mucous membrane.—The *gelatin* cultures, incubated at 20° C., yielded several different kinds of colonies, but none were numerous.

The *agar-agar* cultures, incubated at 37° C., yielded—

(*a.*) Fourteen colonies of *staphylococcus pyogenes aureus.*
(*b.*) Several colonies of *micrococcus liquefaciens tardus.*
(*c.*) A large number of colonies of *bacillus coryzæ segmentosus.*
(*d.*) Several small, circular, flat, almost transparent colonies, in colour corresponding so closely with the agar-agar as to be easily overlooked. They were paler in the centre than elsewhere, with a marked ring-like surrounding zone. Subcultures on *agar-agar* at 37° C. showed in 24 hours very flat, transparent colonies, with scanty white deposit in the condensation fluid. *Broth* at 37° C. became generally turbid in 24 hours; a very scanty stringy deposit appeared, but the broth remained turbid throughout. In hot *gelatin* incubated at 37° C., a considerable flocculent deposit formed in two days. No growth developed on gelatin streak cultures, or in *gelatin* stab cultures kept at 20° C.

Microscopically (*d.*) proved to be a small, diplococcus-like, bi-polar, bacillus, showing in broth cultures, and in agar-agar condensation fluid, short chains of four to six elements. Very many coccus-like forms were present, but the bacillary form was sufficiently marked to make it evident that the organism was bi-polar.

CASE VI.

History of Illness.—A male, aged 40, a toymaker, got wet through on April 22nd, 1895; next day had pains in the head accompanied by "stuffiness," deafness, and running from the nose and eyes. He came under observation on April 30th, the eighth day of his illness, having had in the meantime slight shivering attacks, much thick yellow discharge from the nose, and cough which owing to the "cold" had extended down to the chest. At the time of examination the discharge had become much less in quantity and watery in character; he looked and felt ill, had a very soft pulse and a tongue covered with brownish fur.

Microscopical characters of nasal secretion.—Cover-glass preparations showed a few short bacilli, isolated or in pairs, placed end to end; some showing bi-polar staining.

Agar-agar cultures made direct from the nasal mucous membrane, in three test tubes, and incubated at 37° C., yielded—

(i.) 58 colonies of *micrococcus liquefaciens tardus*.
(ii.) 3 colonies of *staphylococcus pyogenes aureus*.
(iii.) A large number of colonies of *bacillus coryzæ segmentosus*.
(iv.) A considerable number of colonies of an organism almost identical with organism (*d.*) of Case V., but differing from it in forming a granular deposit in the condensation fluid of *agar-agar* at 37° C., and in forming rather longer chains in *broth* cultures.

Case VII.

History of Illness.—A male, aged 24, a house physician, had a nasal discharge, watery in character, beginning at 10 p.m. on May 6th, 1895. He had had no fever, headache, or loss of appetite when he came under observation on May 8th at 11 a.m. Some catarrhal pharyngitis was at this time present. The patient said he was subject to colds in the head. Cultures were then made from the nasal discharge, which was by this time mucoid in character.

Microscopical character of nasal secretion.—Cover-glass preparations showed many leucocytes and a few short bacilli and cocci.

Four *agar-agar* cultures incubated at 37° C., yielded,—

(i.) of *micrococcus liquefaciens tardus*, a large number of colonies.
(ii.) of *bacillus coryzæ segmentosus*, a few colonies.
(iii.) A large number of colonies of an organism culturally and microscopically identical with the organism (iv.) found in Case VI. It formed, like the latter, a granular deposit in the *agar-agar* condensation fluid, the fluid itself remaining clear. Isolated colonies on *agar-agar* were not quite as smooth, circular and flat as in the case of organism (*d.*), Case V.

[At this stage of my investigations samples of a particular bacillus were handed to me by Dr. Klein. It had been obtained from the membrane of a case of sore throat, supposed to be diphtheria, occurring near Colchester. Microscopical preparations of the membrane had shown short bacilli, some of them club-shaped, which were at first taken to be the Klebs-Löffler bacillus. Cultures on *agar-agar* incubated at 37° C. grew slowly and yielded isolated small, flat, and circular colonies, with a distinct greyish-white nuclear centre and a more transparent surrounding zone. Subcultures on *agar-agar* incubated at 37° C. yielded a delicate streak of minute greyish-white raised colonies, smaller than the colonies of the bacillus coryzæ segmentosus and more raised and less transparent than those of the undetermined microbe, or microbes, found in Cases V., VI., and VII. *Broth* cultures incubated at 37° C. did not become turbid, but a moderate flocculent deposit, becoming granular on shaking, formed at the bottom. On *gelatin* surface cultures incubated at 20° C. a few very minute transparent colonies were found at the end of a fortnight.

Microscopically this organism is a bacillus resembling the bacillus coryzæ segmentosus, but smaller and not so often segmented or as much club-shaped as that microbe.

The organism appears to occupy an intermediate position between the bacillus coryzæ segmentosus and organism (*d.*), Case V.]

Case VIII.

History of Illness.—A male, aged 34, a warehouse porter, was attacked on May 13th, 1895, with shivering and giddiness, followed next day by much running from nose and eyes, and subsequently by stuffiness of nose, soreness of throat, with frequent feeling of chilliness and general malaise. He came under observation on May 17th, complaining of running from nose and eyes, especially on going out of doors. There was slight brown fur on the tongue, and a soft slow pulse. The patient was both looking and feeling "seedy." He had no special history of exposure; but he worked, he said, in a draughty building.

Microscopical characters of nasal secretion.—Cover-glass preparations of the mucoid nasal secretion showed bacilli, isolated, in pairs placed end to end, or in small groups. Many showed bi-polar staining.

Examination of Cultures.—Four *agar-agar* tubes were inoculated with the secretion and incubated at 37° C. Three of the tubes yielded many colonies of *micrococcus liquefaciens tardus* and several also of *bacillus coryzæ segmentosus;* while the fourth tube yielded a practically pure cultivation of an organism identical in cultural and microscopical characters with organism (*d.*) of Case V.

General Summary.

Bacillus Coryzæ Segmentosus.—The microbe to which I have given this name was found in seven out of the eight cases of "cold" that were examined. In three of the cases it was much the most abundant of the micro-organisms present; in other three it was present in very considerable numbers; and in the remaining and least severe case (Case VII.) only a few colonies were found. It grows readily on *agar-agar* and in *broth* at 37° C.; slowly on *gelatin* at 20° C. (see Plates IV. and V.).

Pseudo-influenza Bacillus.—This name I propose for the micro-organism (*d.*) found in Case V. and in Case VIII. A similar bacillus found in Cases VI. and VII., presented very slight cultural differences in *agar-agar* condensation fluid, and on the surface of *agar-agar*. A few colonies of like sort were seen in Case II., but I did not succeed in cultivating bacilli therefrom. This microbe resembles the influenza bacillus in the following particulars. It does not grow on *gelatin* at 20° C.; it possesses marked bi-polar character; and it forms chains. It differs from the influenza bacillus in that it causes a general turbidity in *broth* cultures, and in the circumstance that the chains, which it forms, are very short, consisting of 4-8 elements only. Its bi-polar character is so strongly marked that frequently it resembles a diplococcus. In sub-cultures of it many coccus-like forms are also found, and as well a few club-shaped forms, similar to those found in cultures of the bacillus coryzæ segmentosus. Probably these are involution forms, since they are not found in two-day old cultures.

The microbe resembles the influenza bacillus in another very notable sense; its duration of life is very short, rarely more than three days, whether grown on *agar-agar* or in *broth.*

Streptococcus pyogenes longus was found in Case IV. in almost pure culture.

Micrococcus liquefaciens tardus, or *Micrococcus albus*, was found in every case. These micrococci are common skin contaminations.

Staphylococcus pyogenes aureus was found in a few cases.

Thus more than one bacillus, closely allied to the influenza bacillus but differing from it in some biological and microscopical features, has been found in seven out of eight cases of "influenza cold." The single case (No. IV.) in which none of these bacilli were present could not, however, be regarded, clinically, as a well-marked "influenza cold." It is extremely probable that the bacilli in question cause "influenza cold," and that "colds" of this class are etiologically closely allied to true influenza.

ETIOLOGY OF ACUTE "INFLUENZA COLD."

PLATE I.

FIGS. 1 and 2.

Reproduced from photographs* of cover-glass preparations made from the nasal secretion in Case V. The bacilli are seen arranged in pairs, placed end to end, and in groups.

[Magnifying power, 1,000.]

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* *The reproductions of the photographs illustrating Dr. Cautley's Report are by the Autotype Company. The micro-photographs are by Mr. E. C. Bousfield.*

PLATE I.

Fig. 1.

Fig. 2.

PLATE II.

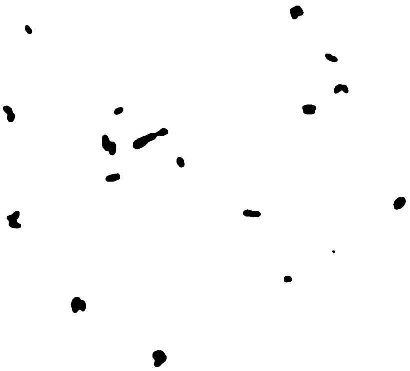


Fig. 3.

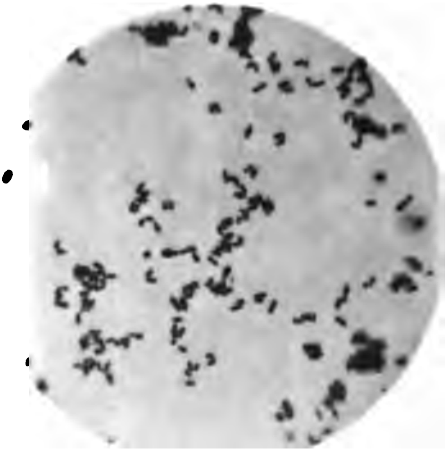


Fig. 4.

ETIOLOGY OF ACUTE "INFLUENZA COLD."

PLATE II.

FIGS. 3 and 4.

Reproduced from photographs of cover-glass specimens of material from cultures on *agar* 24 hours old, of the *Bacillus coryzæ segmentosus*, obtained from the nasal secretion of Case V.

The characteristic club-shaped forms (resembling those of the diphtheria bacillus) and the marked transverse segmentation of the organisms are very apparent.

[Magnifying power, 1,000.]

ETIOLOGY OF ACUTE "INFLUENZA COLD."

PLATE III.

Fig. 5.

Reproduced from a photograph of a cover-glass specimen of material from a *broth* culture of the *Bacillus coryzæ segmentosus*, obtained from the nasal secretion of Case I.

[Magnifying power, 1,000.]

Fig. 6.

Reproduced from a photograph of a cover-glass specimen of material from an *agar* culture, two days old, of the *Bacillus coryzæ segmentosus*, obtained from the nasal secretion of Case I.

[Magnifying power, 1,000.]

Fig. 7.

Reproduced from a photograph of a cover-glass *impression* preparation made from an *agar* culture, two days old, of the *Bacillus coryzæ segmentosus*, obtained from the nasal secretion of Case III.

[Magnifying power, 1,000.]

PLATE III.

FIG. 5.

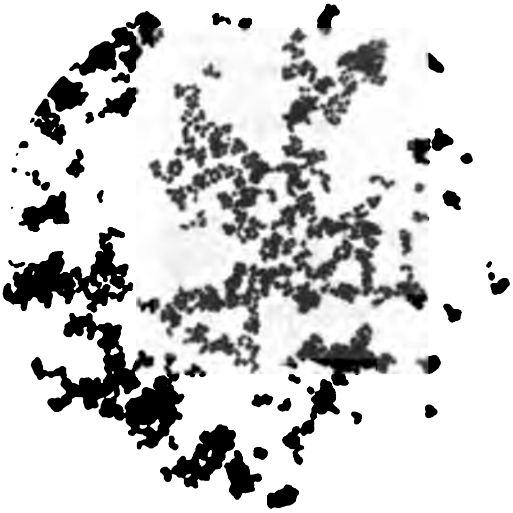


FIG. 6.

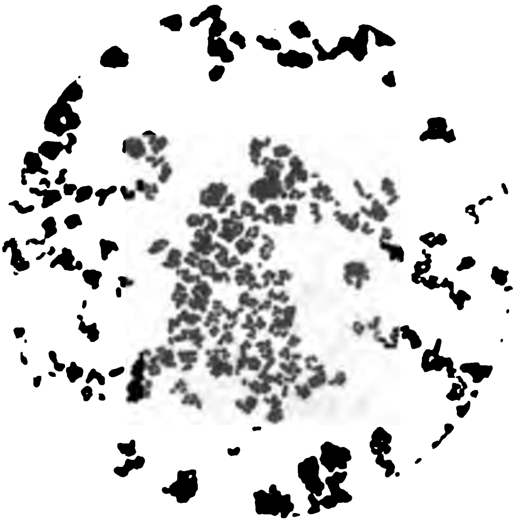


FIG. 7.

PLATE IV.

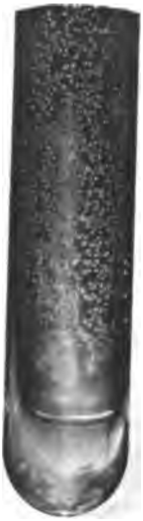


FIG. 8.

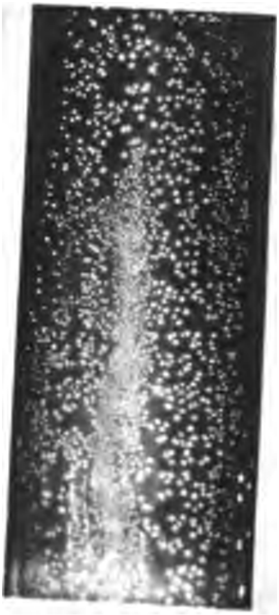


FIG. 9.

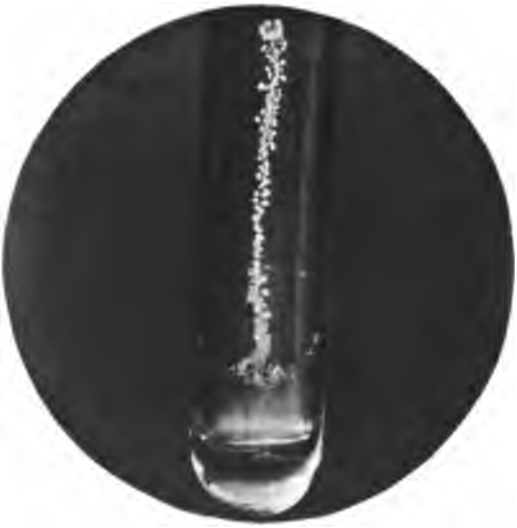


FIG. 10.

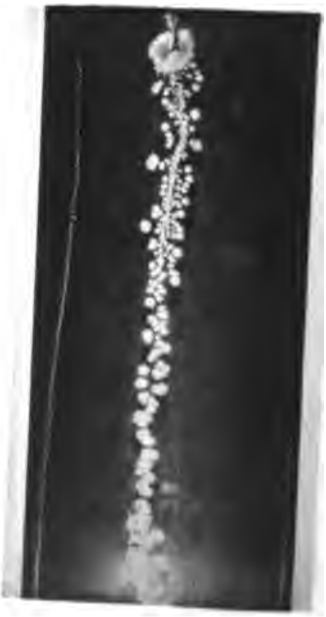


FIG. 11.

ÆTIOLOGY OF ACUTE "INFLUENZA COLD."

PLATE IV.

FIG. 8.

Reproduced from a photograph of colonies on the surface of *agar*, after a week's incubation at 37° C., of the *Bacillus coryzæ segmentosus*, obtained by subculture from Case VI.

[Natural size.]

FIG. 9.

The same, magnified.

FIG. 10.

Reproduced from a photograph of a streak culture on *agar*, after five days' incubation at 37° C., of the same micro-organism, obtained by subculture from Case I.

FIG. 11.

The same, magnified.

ETIOLOGY OF ACUTE "INFLUENZA COLD."

PLATE V.

FIG. 12.

Reproduced from a photograph of colonies on the surface of *gelatin*, after a month's incubation at 20° C., of the *Bacillus coryzæ segmentosus*, obtained by subculture (dilution) from Case III.

[Natural size.]

FIG. 13.

Reproduced from a photograph of a *stab culture in gelatin*, after two weeks' incubation at 20° C., of the same micro-organism, obtained by subculture from Case V.

[Natural size.]

FIG. 14.

Reproduced from a photograph of a *streak culture on gelatin*, after two weeks' incubation at 20° C., of the same micro-organism, obtained by subculture from Case II.

[Natural size.]

FIG. 15.

The same, magnified.

PLATE V.

Fig. 12.

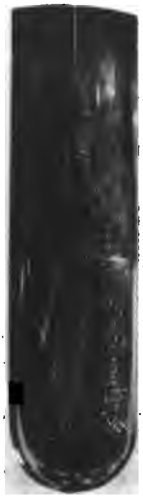
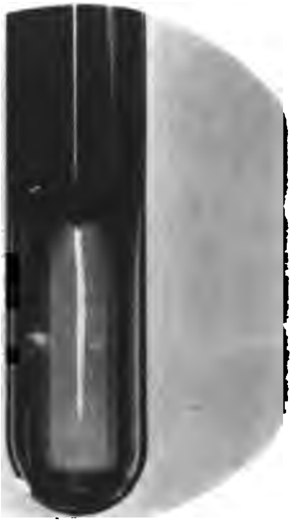


Fig. 13.



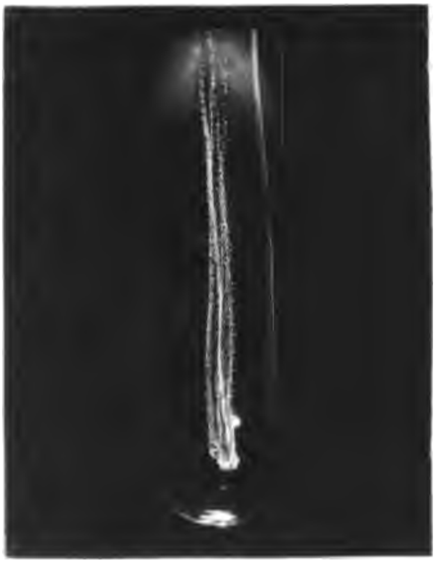


Fig. 14.

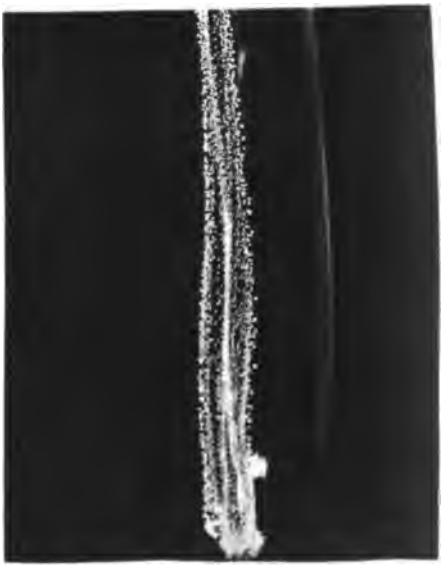


Fig. 15.

No. 7.

App. B. No. 7.

On the Micro-organisms found in Common Articles of Food; by Dr. Cautley.

Report on the Micro-organisms found in Common Articles of Food; by Edmund Cautley, M.D.

Preliminary.

During recent years a considerable number of outbreaks of illness generally characterised by gastro-enteric disturbance, have been traced or ascribed to various articles of food. Examination of the suspected food has on several occasions yielded some micro-organism possessed, as regards rodents, of pathogenic properties of more or less virulence. In other cases poisonous substances belonging to the group of Ptomaines or Toxalbumins have been found.

Dr. Ballard gives* a summary of 14 such outbreaks which came under the notice of the Medical Officer of the Local Government Board, during the years 1880 to 1888. Certain of these were thoroughly investigated and were reported on in detail.

These epidemics may be divided into three groups :—

- I. Cases in which symptoms of acute gastro-enteritis set in a few hours, or even less, after the ingestion of the food.
- II. Cases in which symptoms of acute gastro-enteritis set in after a definite incubation period.
- III. An outbreak characterised by pneumonic consolidation of the lungs, and by a definite incubation period.

The poisonous food in these 14 cases was, or consisted largely of—

Pig-meat of one kind or another in	10	instances.
Veal - - -	1	instance.
Beef - - - -	1	„
Butchers' meat (kind unstated) -	1	„
Tinned salmon - -	1	„

A considerable number of outbreaks of like illness, occurring in various places and referred now to one and now to another kind of food, are mentioned in the "British Medical Journal," 1891–93, as follows :—

Year.	Place.	Food.
1891	London - - - -	Tinned salmon.
„	Louisville, Kentucky - -	Not stated.
1892	Tipton - - - - - -	Tinned beef.
„	Chatham - - -	Tinned sardines.
„	Hampstead - - - -	Tinned ox tongue.
1893	Denbigh - - -	Pickled or corned beef.
„	Kilmington - - - -	Pork pie.
„	Cardiff - - -	Melton Mowbray pork pie.
„	Harrow School - - -	„ „
„	Harpurhey - - -	Tinned meat or potted meat.
„	Burry Port - - -	Brawn.
„	Worksop - - -	Not stated.
„	Not stated - - - -	Cooked pork.
„	Peckham - - -	Pork pie.
„	Yorkshire - - - -	„
„	Camberwell - - -	Leicester pork pie.
„	Forest Gate - - - -	Salt beef or soup.

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* Report of Medical Officer to Local Government Board, 1890, p. 189 *et seq.*

Various occurrences of illness during the months of June, July, and August 1894, referred to food poisoning, are tabulated in the "British Medical Journal," 1894, II., p. 725, as follows:—

Article of Food.	Number of Cases.	Number of Deaths.
Potted meat - - - - -	19	—
Meat and kidney pie - - - - - -	19	—
Meat (kind not stated) - - - -	10	1
Tinned salmon - - - - - - -	2 families and 1 other person.	1
Brawn (made from fresh meat) - -	1 family	1
Pork - - - - - - - - - -	5	1
Lamb - - - - - - -	5	—
Tinned sardines - - - - - -	4	—
Ham - - - - - - -	3	—
Green cheese - - - - - - -	3	—
Fried fish - - - - - -	1	1

Beef yielding a specific bacillus was the food implicated in the German beef case in 1888 (Gärtner. Correspondenzbl. des allg. ärztl., Vereins von Thüringen, 1888, p. 573). Sausages made from horse-flesh caused a fatal epidemic among factory men at Egelsdorf and Rohrsdorf, in 1890, and yielded a bacillus similar to but not identical with that which Gärtner obtained (Gaffky and Paak, Arbeiten aus dem K. Gesundheitsamte, 1890, Bd. VI., 2 and 3). Vaughan (Trans. VIIth Internat. Congress of Hygiene and Demog., Vol. III., p. 122) refers to a case of poisoning by custard made from milk; one half was frozen at once and was harmless, while the other half stood in a filthy stinking room before being frozen and was poisonous. Vaughan also refers to a case of poisoning by tinned salmon in which a micrococcus was found in large numbers. Subcultures of this microbe on ordinary media were harmless when injected into animals, but if the organism was grown for 20 days in a sterilized egg, after Hueppe's method of anäerobic culture, it produced a powerful proteid poison. The white of the egg became thin and watery and markedly alkaline: ten drops were sufficient to kill a white rat when injected subcutaneously.

Looking through the cases referred to above, it is found that the article of food most commonly implicated is pig-meat in one form or another. Next comes *tinned* food of various kinds.

The nature of the poison is either microbial or the products of microbial life, or a combination of the two.

The organism producing the poison may have been present in the food when bought or may have obtained access to it "accidentally" afterwards. Thus in some cases recently cooked meat has been eaten with impunity, and yet, subsequently, when cold, has given rise to fatal results. It becomes, therefore, of importance to know: *First*, What organisms are commonly present in ordinary articles of diet; *Secondly*, What are the biological characteristics of the organisms found, and have they any pathogenic action (*a*) when ingested, (*b*) when injected subcutaneously; *Thirdly*, What is the effect of cooking, salting, smoking, and other modes of preserving food, on the organisms commonly present in such foods.

Some of the cases above referred to tend to show that meats, even when salted, smoked, and cooked, may contain living pathogenic organisms, which were present in the flesh prior to the death of the animal. Thus, in the German beef case, Gärtner found the same bacillus in the flesh of the cow killed on account of an acute diarrhœal illness and in the spleen of the man who died 12 hours after eating some of the cooked meat.

A certain amount of important work has been done with reference to the effect of the different methods of preserving meat on the micro-organisms present in them.

Forster (Münch. med Wochenschr., 1890, No. 16) states that tubercle bacilli, typhoid bacilli,* pus cocci, and the bacillus of swine plague resist the action of saturated salt solution for weeks and even months. The ordinary processes of salting and smoking did not destroy the tubercle bacillus in the flesh of a cow which had died from tuberculosis.

Petri (Arbeiten aus dem K. Gesundheitsamte, 1890, Bd. VI., Ht. 2), in experiments on the swine plague bacillus, found that the flesh retained its infectivity after being in brine several months; also, if salted and pickled for a month and then smoked for 14 days. A ham smoked for three months was also virulent, but not at the end of six months.

Beu (Centralbl. für Bacteriol., 1890, Bd. VIII., pp. 513 and 545) examined a large number of specimens of fresh, salted, and smoked meats and fishes. He found a limited number of various sorts of bacteria in the fresh specimens, and that they were not destroyed by smoking for several days. A "liquefying" bacillus found in sausages was not destroyed by smoking for 14 days, but was destroyed at the end of six weeks. A "non-liquefying" bacillus in the same sausages was not destroyed even in six weeks. Fourteen days' smoking destroyed all the organisms in bacon, but not those in the interior of a ham. He found various organisms in cooked meats; among these staphylococcus pyogenes (aureus, citreus, and albus), proteus vulgaris, and bacillus liquefaciens viridis.

Shell fish, more especially oysters and mussels, are a not uncommon cause of poisoning. As long ago as 1827 Combe described in detail the symptoms induced by eating poisonous mussels. Schmidtmann (quoted by Vaughan, loc. cit.) has recently found that non-poisonous mussels placed in the water of Wilhelmshaven, soon became poisonous, and that if transferred to the open sea these poisonous mussels soon became harmless again. Linder found in the water of this harbour various low forms of life which were not found in the non-poisonous mussels nor in the open sea. He found also that mussels placed in the filtered water of the bay were not affected, and concluded that the mussels became poisonous from disease due to residence in filthy water. Brieger discovered a chemical poison, mytilotoxin, in the affected mussels, and that this poison caused illness in man, and MacWeeny has found exceedingly virulent bacilli in mussels. Sir Peter Eade (British Medical Journal, 1895. I., p. 121) notes his suspicion that an epidemic of typhoid fever, occurring a few years ago at Norwich, was due to ingestion of mussels from mussel beds infected by sewage. And at the beginning of 1895 a considerable number of facts were brought forward by Sir William Broadbent and others, which lend support to the view that typhoid fever may be caused by eating oysters.

During 1893 some sporadic cases of cholera were suspected to be due to the ingestion of oysters from Grimsby, where cholera existed in epidemic form. Cases of severe poisoning, sometimes fatal, have occasionally resulted from the ingestion of bad oysters.

An epidemic of typhoid fever occurred among the students of the Wesleyan College, Middletown, Connecticut, during October and November 1894 (H. W. Conn, Med. Record of New York, 1894) and was traced to raw oysters from Long Island Sound, which, before being distributed to customers, had been removed to the mouth of a fresh-water stream for a few days to "fatten." About a hundred yards above the place where they were deposited was the outlet of a sewer which had been receiving typhoid excreta.

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* His observations on the action of saline solutions on the typhoid bacillus are not supported by those of other observers.

For some years, at both Rome and Naples, oysters have been the cause of acute gastro-enteric disturbance, and they have also been regarded as vehicles of conveyance of typhoid infection.

De Giaxa (Zeitschrift für Hygiene, 1889, Bd. VI.), made some investigations at the Bacteriological Laboratory in Naples as to the action of sea-water and of oysters on pathogenic micro-organisms. He holds that the multiplication of cholera bacilli in sea-water depends on the number of other micro-organisms present; the fewer the other microbes present in the water, the more rapidly the cholera organism developed and the longer it lived. The typhoid bacillus did not thrive in natural sea-water, but was identified at the end of the ninth day; in sterilized sea-water these bacilli were detected in very appreciable numbers on the twenty-fifth day. In oysters and mussels inoculated with broth cultures of cholera bacilli, introduced through a small hole bored in the shell afterwards closed with sealing wax, the organism disappeared in six hours in most cases, and in two only was detected in small numbers at the end of 24 hours. The same author found many varieties of micro-organisms in the fluid inside the shell and surrounding the oyster, but only two varieties, although these two were very abundant within the mollusc itself. Cassedebat (Lyon Méd., 1892, pp. 70 and 458, &c.), however, in his experiments with sea-water, found that typhoid bacilli were destroyed in 24 hours in sterilized sea-water; while Percy Frankland found that the addition of 1·3 per cent. of common salt to ordinary Thames water was very prejudicial to the typhoid organism, and favourable at the same time to many forms of water bacteria. In salted sterilized water the typhoid bacillus disappeared very rapidly.

I pass on now to my own observation, from the bacteriological view point, of different articles of food.

Micro-organisms present in Oysters.

Two series each of six oysters were examined. The first series was obtained and examined in November 1894. The second series was obtained in January 1895; but only four out of these six were examined, putrefactive changes having occurred in the remaining two. Nothing was known as to where the oysters came from, except that they were bought in a fish market and were called Dutch oysters.

Mode of Examination.—The oysters were thoroughly well washed in tap water when first obtained, and also subsequently previous to being opened. Of series I. the first was examined on November 1st, and the sixth on November 9th. After the shell was laid open, the oyster was removed and well washed in sterile salt solution, dried with blotting paper, and an incision then made with a sterile knife. Cultures were made on *gelatin* and *agar-agar* from the fluid exuding from the cut surface of the oyster. The *agar-agar* cultures in the first four cases were incubated at 37° C., and in none did more than two or three colonies develop. On account of the negative results obtained by cultivation on *agar-agar*, incubated at 37° C., in the first four cases fully examined, only *gelatin* cultures were employed in the remaining cases. Sub-cultures were made on various nutrient media from the colonies which grew on the surface of the gelatin originally inoculated.

In what follows respecting micro-organisms derived from the oyster, those only of them which appeared to me particularly deserving of notice, on account of their numbers or some definite characteristic, are numbered consecutively.

Oyster I.—Colonies of two varieties of micro-organisms developed, on gelatin, in fairly large numbers, but No. 1 far more numerously than No. 2.

Micro-organism No. 1.—Colonies of a non-chromogenic, äerobic and facultative anäerobic, liquefying, motile bacillus, growing freely at 20° C., but not at all at 37° C. In sub-culture on *gelatin plates* minute, round, glistening colonies formed in 24 hours; in 48 hours the colonies became whitish, and in 72 hours liquefaction commenced. Certain *Gelatin streak*-cultures exhibited small, separate, liquefying colonies in 48 hours. Others showed a coherent white growth with slow liquefaction of the gelatin, whitish films of growth adhering to the surface of the gelatin along the line of inoculation; the gelatin was completely liquefied in three weeks, contained a dense dirty white deposit and small grey films on the surface, and had a sickly smell. *Gelatin stab*-cultures showed small white colonies along the line of puncture in 24 hours; no surface expansion formed and liquefaction commenced on the third day, assuming a funnel-shaped appearance beneath the surface with a small clear-cut hole forming the mouth of the funnel and dense white deposit sticking to the apex. On *agar-agar* at 20° a greyish-white film developed in 24 hours. In *broth* a small granular white deposit settled down at the bottom and an offensive smell developed. *Microscopically:* the organism is a small bacillus with rounded ends. Agar-agar and broth cultures exhibited a few larger forms, but no chains or threads. It was not found pathogenic to mice, whether administered by the mouth or inoculated subcutaneously.

Micro-organism No. 2.—Colonies of a non-chromogenic, non-liquefying, äerobic and facultative anäerobic, motile bacillus, growing readily on gelatin both at 20° C. and 37° C., to which I give the name of *Bacillus membranosus* on account of some of its cultural characters. Isolated colonies on *gelatin plates* are flat, white, with irregular edges. On *gelatin streak*-cultures a profuse white growth formed in two days, which in five days became thick, tenacious, and membranous. *Gelatin stab*-cultures showed a thin, concave, circular, white film, covering half the surface, and a delicate white streak along the line of puncture. Cultures on *agar-agar* at 37° C. showed a fairly profuse, white, tenacious growth in two days, with moderate deposit; the growth afterwards became thicker, whiter, and membranous, with a raised, well-defined edge. In *broth* a considerable flocculent deposit settled to the bottom, and the supernatant fluid became clear; on shaking up the deposit it was seen to consist of delicate material in small masses with irregular edges. *Microscopically:* the organism is a short regular bacillus with rounded ends. In broth cultures it formed chains, which rather resembled chains of cocci. It is non-pathogenic to mice.

Oyster II.—No colonies were obtained from cultures made on *gelatin* and *agar-agar* and incubated at 20° C., nor from cultures on *agar-agar* at 37° C.

Oyster III.—*Agar-agar* cultures at 37° C. remained sterile. The three *gelatin* cultures at 20° C. yielded four varieties of colonies.

Micro-organism No. 3.—A few colonies of *proteus vulgaris.*

Micro-organism No. 4.—A few smooth, raised, whitish colonies of an organism which I have named the *Spirillum ostreæ*, a non-chromogenic, non-liquefying, äerobic, actively motile, spiral bacillus. In sub-culture on *gelatin plates* small transparent colonies developed in the course of four days; at the end of a week, when examined by transmitted light, the colonies as a rule had a kidney-shaped appearance, with a dark brown mass at the hilum and a lighter brown medullary portion consisting of radiating striæ composed of minute black granules. In some the dark brown mass is small and round, and nearer the centre of the colony. In *gelatin shake*-cultures the colonies grew freely on the surface and just below it, but not at all deeper down. *Gelatin stab*-cultures showed a surface growth which extended to the sides of the tube, but which scarcely extended below the surface. On *gelatin streak*-cultures a greyish-white growth developed, and remained limited to the line of inoculation. On *agar-agar*, at 20° C., a profuse greyish-white growth and deposit developed in two days. *Broth* at 22° C. became turbid in four days, and a flocculent thread-like mass formed and floated near the surface. The broth remained odourless. No growth in broth at 37° C. *Microscopically:* curved bacilli, growing into long spirals. They did not prove pathogenic to mice.

Micro-organism No. 5.—A few small white colonies of a non-chromogenic, liquefying, äerobic and facultative anäerobic *staphylococcus*, growing at 20° C. and not at 37° C. On *gelatin streak*-cultures a delicate greyish-white growth formed in 24 hours, liquefaction commenced in two days and proceeded very slowly; isolated colonies at the end of five days were very small, white, and depressed below the surface. *Gelatin stab*-cultures liquefied very slowly. On *agar-agar*, at 22° C., a profuse greyish-white growth and a moderate deposit developed in two days. *Broth* at 22° C. showed slight turbidity in 24 hours; the turbidity increased, and a scanty deposit settled. *Microscopically:* a coccus, varying much in size, many of the large forms being probably involution forms; many groups. It is not pathogenic to mice.

Micro-organism No. 6.—Several colonies of a chromogenic, non-liquefying, äerobic and facultative anäerobic, actively motile bacillus to which I have given the name of ***Bacillus coralinus.*** The organism grows at 20° and 37° C. On *gelatin plates* the superficial colonies developed slowly, and at the end of five days were small, ⅛ to ⅙ inch diameter, circular, with irregular edges, of a beautiful coral-pink colour. In the depth the colonies were also small, round, and pink. On *gelatin streak*-cultures a moderate white growth, with a pinkish tinge where thick, formed in 24 hours; at the end of 48 hours the whole growth was pink. In *gelatin stab*-cultures a raised pink knob developed at the point of puncture, and the pink colour slowly extended downwards; the growth on the surface and in the depth being white at first. On *agar-agar*, at 20° C., a pinkish-white growth and a moderate deposit formed; at 37° C. the growth had the same appearance without the colour. *Broth*, at 20° C. and at 37° C., became turbid in 24 hours, and a scanty white deposit settled to the bottom, which, at 20° C., became pink afterwards. *Milk* remained uncoagulated, and at 20° C. became pinkish in colour especially near the surface. *Microscopically:* the organism is a small, regular, motile bacillus. Mice inoculated subcutaneously with a syringe full of broth culture of this bacillus were in no way affected.

Oyster IV. Gelatin plates yielded a few colonies of *proteus vulgaris*, and in addition two varieties of micro-organisms.

Micro-organism No. 7.—A few colonies of a non-chromogenic, liquefying, äerobic and facultative anäerobic, non-motile bacillus, growing freely at 20° C. and feebly at 37° C. On *gelatin plates*, the surface colonies were raised, smooth, and white, with clean cut edges, while the colonies in the depth were small and round, dark brown, and granular when seen by transmitted light. On *gelatin streak*-cultures a whitish growth developed, and liquefaction was complete in 14 days; a dense, tenacious, stringy, white deposit settling to the bottom of the tube. In *gelatin stab*-cultures liquefaction began near the surface and extended downwards in a broad funnel-shaped form, with sharply defined edge and dense white deposit. Very few colonies developed along the line of puncture in the depth. *Gelatin shake*-cultures yielded no gas bubbles; the colonies grew best on and near the surface, being very small and ill-developed below it; liquefaction proceeded from the surface downwards. Isolated colonies on *agar-agar* at 22° and 37° C. were smooth, raised, flat, round, and white; and there was much deposit in the condensation fluid. *Broth* became turbid in 24 hours and had no smell. *Milk* was uncoagulated. *Microscopically:* a long thin non-motile bacillus. It is not pathogenic to mice when injected subcutaneously.

Micro-organism No. 8.—Bacillus flavus viridescens.—A large number of colonies of a feebly chromogenic, non-liquefying, äerobic and facultative anäerobic, actively motile bacillus, growing freely at 20° C., but not at all at 37° C. Isolated colonies on *gelatin* at the end of 14 days were small, raised, and smooth, with a white centre and clear surrounding zone; a few days later the colonies acquired a yellowish tinge, and at the end of three weeks were somewhat greenish. In mass on *gelatin plates*, the superficial colonies were minute, round, and raised; viewed by transmitted light they showed a brown granular centre, a granular intermediate zone, and a lighter peripheral zone. In *gelatin stab*-cultures minute colonies developed along the line of puncture, and there was no surface expansion. In *gelatin shake*-cultures no gas bubbles were formed. On *agar-agar*, at 20° C., a smooth, raised, white growth, with moderate deposit in the condensation fluid, formed in 24 hours; in three days both the surface growth and the deposit acquired a yellowish tinge. *Broth* became turbid in 24 hours and a scanty tenacious white deposit settled, the supernatant fluid remaining turbid. *Microscopically:* the organism is a small, regular bacillus, with rounded ends and active screw-like motility. Not pathogenic to mice when injected subcutaneously in large doses.

Oyster V. yielded five varieties of colonies. Certain liquefying colonies proved on cultivation to be varieties of proteus vulgaris. The other four are described below. No. 9 was very much the most numerous.

Micro-organism No. 9.—Very numerous colonies of a non-chromogenic, liquefying, äerobic, non-motile bacillus, growing freely at 20° C. and not at all at 37° C, closely resembling organism No. 7 but not identical with it. Isolated colonies on the original *gelatin* cultures at the end of 24 hours were minute, round, raised, and watery-looking; in 48 hours they were somewhat conical and white. *Gelatin streak*-cultures showed in two days a well-marked growth, composed of white colonies aggregrated together, giving off lateral outgrowths; liquefaction commenced in 3 days and proceeded with moderate rapidity, the growth remaining coherent and sinking down in the liquefied gelatin. In *gelatin stab*-cultures a slight surface expansion formed; liquefaction commenced at the surface on the third day and extended slowly downwards. In *gelatin shake*-cultures no gas formed, colonies developed on and near the surface, and liquefaction commenced on the surface. On *agar-agar*, at 20° C., a thick, smooth, raised, white growth developed and there was much white deposit in the condensation fluid. *Broth* at 20° C. became turbid in 24 hours,

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and considerable white deposit eventually settled. *Milk* remained uncoagulated. *Microscopically:* a small, regular, non-motile bacillus. Non-pathogenic to mice.

Micro-organism No. 10.—Several colonies of a non-chromogenic, non-liquefying, äerobic, non-motile bacillus, growing profusely at 20° C. and not at all at 37° C. On *gelatin plates* the isolated colonies were small, round, raised, and wax-like; they increased slowly in size, and, viewed by transmitted light, had a distinct brown centre with a lighter brown peripheral zone; some of them were kidney-shaped. On *gelatin stab*-cultures a slight surface expansion formed. On *gelatin streak*-cultures a profuse white growth with lateral branches rapidly developed. In *gelatin shake*-cultures the organism did not produce gas. On *agar-agar*, at 20° C., a thick white growth formed. *Broth* at 20° C. became rapidly turbid, and a dense white deposit settled. *Milk* was not coagulated. *Microscopically:* a small, non-motile, peculiarly isolated bacillus. Not pathogenic to mice when injected subcutaneously.

Micro-organism No. 11.—Several colonies of a non-chromogenic, liquefying, actively motile, äerobic bacillus, growing freely at 20° C. and not at all at 37° C. On *gelatin plates* smooth, raised, circular, white colonies developed in two days, and commenced to liquefy the gelatin in four days. Small, circular pits, with clean cut edges and white dense deposit, then slowly formed. On *gelatin streak*-cultures a delicate, almost transparent, growth formed in 24 hours; it gradually became rather thicker and greyish-white, and liquefied slowly. Liquefaction commenced in *gelatin stab*-cultures at the end of six days and extended slowly down in a funnel-shaped form; no surface expansion. In *gelatin shake*-cultures the organism grew on and near the surface, but not at all deeper down; no gas formed; liquefaction commenced on the surface in the form of minute pits. A moderately thick white growth developed on *agar-agar* at 20° C. *Broth* at 20° C. became very turbid and had a peculiarly offensive smell. *Milk* was uncoagulated. *Microscopically:* a bacillus, varying in length and thickness. Not pathogenic to mice. Comparing this with Organism No. 1, it is found that it resembles it very closely, and only differs in the mode in which liquefaction proceeds in the *gelatin stab*-cultures. The broth cultures of No. 1 were also rather more offensive to the smell.

Micro-organism No. 12.—A few colonies were present in the original gelatin cultures of a non-chromogenic, liquefying, äerobic and facultative anäerobic, actively motile bacillus, growing freely at 20° C. and not at all at 37° C. On *gelatine-plates* it formed depressed circular pits with clean cut edges due to liquefaction of the gelatin; the colonies, at first white and raised above the surface, sank to the bottom of the pits as a dense white deposit with a surrounding granular turbid zone. On *gelatin streak*-cultures a whitish growth was present at the end of 24 hours, by which time liquefaction had begun. The liquefaction proceeded with moderate rapidity along the line of inoculation, forming a deep furrow with cleanly cut edges; a thin film of growth remained adherent at the bottom of the furrow and dense yellowish-white deposit settled to the bottom of the tube. *Gelatin stab*-cultures showed in 24 hours minute white colonies along the line of inoculation, liquefaction commencing at the surface where the growth exhibited a slight flat circular expansion. The liquefied gelatin assumed a funnel-shaped appearance with sharply defined edges and dense cheesy deposits. In *gelatin shake*-cultures colonies developed throughout, with a slightly reddish brown tint, growing more freely near the surface; no gas developed; liquefaction proceeded from the surface. On *agar-agar*, at 20° C., a profuse, smooth, white growth, with horizontal lateral outgrowths formed in two days;

much white deposit in the condensation fluid. *Broth* at 20° C. became turbid in 24 hours, acquired a sickly smell, and much white deposit settled. *Milk* was not coagulated. No growth took place in broth at 37° C., and in cultures subsequently incubated at 37° C. for 24 hours the organism was destroyed. *Microscopically:* a short bacillus with rounded ends, varying a little in size. Not pathogenic to mice whether inoculated subcutaneously or given by the mouth.

Oyster VI., at the time the cultures were instituted, was slightly greenish in colour but had no offensive smell. Three gelatin cultures were made, which at the end of 24 hours contained a large number of minute, round, raised, transparent colonies. These proved, on further growth and as a result of sub-cultivation, to comprise three of the varieties of organisms already described or mentioned above, namely:—

(*a.*) *Organism No.* 12: a very large number of colonies, very much more numerous than the other two sorts.

(*b.*) *Organism No.* 11: a few colonies only.

(*c.*) *Proteus vulgaris No.* 3: a considerable number of colonies.

Oyster VII. yielded only three colonies in the four gelatin tubes inoculated. One colony of organism No. 2, *Bacillus membranosus*; and—*No.* 13—two colonies of actively motile bacilli with rounded ends; non-chromogenic, äerobic and facultative anäerobic, growing freely on the ordinary culture media at 20° C. and feebly at 37° C.; slowly liquefying gelatin.

Oyster VIII. yielded many and various colonies:—

(i.) A few of *proteus vulgaris, No.* 3.

(ii.) Several of organism No. 12.

(iii.) A non-chromogenic, non-motile spore forming bacillus, not growing at 37° C.

(iv.) Several colonies of organism No. 13.

(v.) Several of a very minute bacillus, not growing at 37° C., and not liquefying gelatin. This bacillus was found also in the fluid surrounding the oyster.

Oyster IX. Only one sort of colony was present, and of that there were comparatively few. It proved on sub-cultivation to be No. 12.

Oyster X. yielded two varieties of colonies:—

(i.) A few colonies of organism No. 12.

(ii.) Several colonies of a non-chromogenic, non-liquefying, äerobic and facultative anäerobic, very motile long thin bacillus, growing only at 20° C. Not pathogenic to mice.

In addition to these, several other organisms were obtained from the various cultures made from the ten oysters, *e.g.*, *bacillus mesentericus fuscus* in two cases, a *cladothrix* in one case, and various bacilli, liquefying and non-liquefying.

I examined the fluid surrounding the oysters in all cases, more especially with reference to the presence of the *bacillus coli* and the *typhoid bacillus.* These two organisms were not present in any one of the three gelatin cultures made from the fluid of each oyster. As a rule liquefying organisms were more numerous in the fluid than in the oyster itself. Several organisms present in the cultures from the oyster were also present in the surrounding fluid.

The most conspicuous fact respecting the organisms obtained from uncooked oysters was that most of them not only did not grow at 37° C., but were destroyed by exposure to that temperature for 24 hours.

Micro-organisms present in Uncooked Mackerel.

Mode of Examination.—On May 29th six fresh mackerel were obtained from a fish market. One was reserved for immediate examination and the others were well washed in tap water, placed in a long shallow dish, covered with a sheet of glass, and kept in the laboratory. On the following day the fluid in the dish was found so crowded with micro-organisms that it was deemed advisable to wash the fish and dish daily in weak solution of perchloride of mercury. The fish were examined at intervals of two or three days after the following method: after being thoroughly washed in weak perchloride solution the skin was dissected off the back and a portion of the muscle, 1 inch long and about half an inch in depth and breadth, removed, sterilized instruments being, of course, employed. The portion of muscle removed was well washed in boiled salt solution.* After being washed an incision was made with a sterile knife into the muscle, and cultures made on gelatin, and on agar-agar, and in broth. Cover-glass preparations were also made and stained.

The weather for the time of year was comparatively cold; nevertheless, in four days the fish became somewhat high; the flesh became soft and homogeneous in appearance, of a dirty pink colour, and emitted a sickly smell.

A seventh mackerel was obtained and examined in July.

Mackerel I.—Cover-glass preparations of the blood and muscle-juice showed many large bacilli and cocci, and also a large number of small oval bacilli showing bipolar staining. Cultures made on *agar-agar* and in *broth* and kept at 37° C. remained sterile. Cultures on *gelatin* at 20° C. yielded 11 colonies, which proved to be similar to the colonies of organism A. obtained from the second fish.

Mackerel II.—Cover-glass preparations showed large numbers of bacilli varying in size, usually oval and exhibiting marked bipolar staining. Frequently two were placed end to end. Cultures kept at 37° C. remained sterile *Gelatin* cultures at 20° C. showed in 24 hours a large number of minute transparent colonies; in two days the colonies were circular, raised, transparent, and as large as small pin-heads. Under a low power of the microscope they were seen to be circular, light-brown in colour with deeper coloured centre. These cultures proved to be absolutely pure, except for a few larger, raised, whitish colonies, with smooth dome-like surface. The more numerous colonies are described under the name of organism A.; the others under that of organism B.

Characters of Organism A. — On *gelatin streak*-cultures a very delicate growth with bluish-white tinge, composed of agglomerated minute colonies, developed in 24 hours. At the end of four weeks the isolated colonies were of the size of small pin-heads, fluffy, and whitish in colour; not raised and dome-like as colonies of Organism B. *Broth* at 20° C. became turbid in 24 hours and a scanty deposit slowly settled. On *agar-agar*, at 20° C., small round white colonies and scanty deposit formed in 24 hours. *Microscopically:* this micro-organism was found to be a peculiar oval bacillus, showing marked bipolar staining and many coccus-like forms: also a few larger and thicker forms; often vacuolated; no chains or threads; sometimes arranged in pairs placed end to end. Not pathogenic to mice where injected subcutaneously.

Characters of Organism B.—Isolated colonies on *gelatin* at the end of four weeks are small, of the size of large pin-heads, circular, raised, with a smooth dome-like surface and wax-like appearance. *Gelatin streak* sub-cultures in 24 hours showed a very delicate streak of transparent, watery looking, minute colonies; gradually the growth became white. No liquefaction ensued. *Broth* became turbid in 24 hours and remains turbid at the end of three weeks, a scanty dust-like deposit settling down. On *agar-agar* at 20° C. a delicate, almost transparent growth formed in 24 hours; in four days it was more profuse and greyish-white; flocculent deposit in the condensation fluid. *Microscopically:* a bacillus closely resembling organism A. Not pathogenic to mice.

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* In the case of the first fish, saturated solution of perchloride of mercury was employed; but it was found that this penetrated the tissues so rapidly and acted so powerfully that very little growth resulted.

Mackerel III.—Cover-glass preparations showed many large oval and bipolar bacilli; some forms closely resembling diplococci. Cultures yielded—

(i.) Organism B.: in almost pure culture.
(ii.) Organism A.: a few colonies.

Mackerel IV.—Cover-glass preparations resembled those of Mackerel III. In cultures—

(i.) Organism B.: predominated.
(ii.) Organism A.: a considerable number of colonies.

Mackerel V.—Cover-glass preparations showed many of the same forms seen in the preparations from the other fish, and also a large number of rod-shaped bacilli, spindle-shaped, and spiral forms, and threads.

Cultures yielded—

(i.) Organism A.: many colonies.
(ii.) Organism B.: many colonies.
(iii.) Proteus vulgaris: several colonies.

Mackerel VI.—Cover-glass preparations showed many of the usual forms and several larger rod-shaped bacilli.

Cultures yielded—

(i.) Organism A.: a few colonies.
(ii.) Organism B.: a large number of colonies.
(iii.) Proteus vulgaris: many colonies.

Mackerel VII.—Cover-glass preparations shewed many oval, bipolar bacilli and diplococcus-like forms.

Cultures yielded—

(i.) Organism A.: a few colonies.
(ii.) Organism B.: almost in pure culture.

Results of Examination of Mackerel.—Two organisms were found constantly present, A. and B.; except in the first two fish, organism B. was much the most numerous. Microscopically, both are oval, vacuolated, and bipolar bacilli, showing coccus-like forms. Culturally, B. differed from A. in its mode of growth on *gelatin*, forming larger, more raised, whiter, dome-like colonies; in old cultures isolated colonies of B. had a distinct yellowish centre.

These organisms appear to be perfectly harmless. Exposure to 37° C. for 24 hours kills them. Mice, fed on bread soaked in large quantities of the cultures, or inoculated subcutaneously, were not in the least affected.

Fresh Herrings.

Mode of Examination.—Three fresh herrings were obtained from a fish market. One was examined the same morning. The other two were well washed in tap-water, placed in a large flat dish with raised sides, and covered with a sheet of glass. These were examined on the third and fourth day respectively. The weather was not unduly warm, although the time of year was the month of July.

Each fish was well washed in tap-water before examination, and dried with blotting paper. The skin was dissected off the back by sterilized instruments, and a portion of the muscle from the middle of the back about an inch long and three-quarters of an inch in breadth and

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thickness, cut out with a sterilized knife. This portion was then well washed several times in boiled salt-solution; an incision was made through the middle, and three agar-agar cultures and three gelatin cultures were inoculated with the fluid exuding from the cut surface. Three gelatin cultures and one agar-agar culture were placed in an incubator at 22° C., and other two agar-agar cultures were incubated at 37° C. Four cover-glass preparations were made from each fish.

Cover-glass preparations were stained in Weigert's methyl-blue, and showed the following organisms:—

Herring I.—An occasional diplococcus and a few short bacilli.

Herring II.—Numerous oval bacilli, many showing marked bi-polar staining. A few longer and more rod-like bacilli.

Herring III.—Numerous short oval bacilli, many with bi-polar staining. Also several long rod-shaped bacilli.

Most of these bacilli did not liquefy gelatin. No streptococcus was found in any of the fish. Only one variety of staphylococcus (a single colony) was present, and that in only one out of the three herrings.

The non-liquefying bacilli were of three kinds, namely:—

A. A *bacillus* growing freely on *gelatin* at 22° C. and 37° C., found in considerable numbers in the second and third fishes, but more numerous in the latter. On *gelatin plate*-cultures the colonies were flat, whitish, and expanded, with irregular fluffy edges on the surface. In the depth they were oval or round, and dark brown by transmitted light. On *agar-agar plate*-cultures, large, white, raised colonies, circular, with smooth surface and well-defined edge were formed. The colonies grew more rapidly at 37° than at 20° C. In *gelatin streak* cultures, a thick, raised, white growth formed along the line of inoculation in 48 hours. In *gelatin stab*-cultures scanty, slow growth of minute round colonies along the puncture occurred, each showing a small, thick, raised, white knob on the surface, with irregular edges. In *agar-agar* cultures at 37° C., there appeared moderate greyish-white growth on the surface and scanty shreddy deposit in the condensation fluid. In *broth* cultures at 37° C. the broth became cloudy throughout and a moderate deposit settled at the bottom of the tube in 48 hours. Smell offensive. At the end of two weeks there was considerable stringy deposit and dense general cloudiness; and the smell became still more offensive. No indol reaction developed. *Microscopically:* Short bacilli with rounded ends, feebly motile. In broth and agar-agar cultures the bacilli varied in size. Mice fed freely on broth cultures were apparently unaffected.

B. A *bacillus* growing on the usual culture media at 20° C.; but destroyed by exposure to a temperature of 37° C. for 24 hours. Colonies of this organism were obtained by cultivation from all three fish; most numerous in No. 2. On *gelatin plates* small transparent round colonies were visible at the end of 24 hours. *Streak* sub-cultures on *gelatin* showed in 24 hours a delicate growth, along the line of inoculation, composed of similar minute clear colonies. The growth at first resembled that of streptococcus pyogenes, but in course of time the colonies became greyish-white and ran together, forming a delicate white film on the surface of the gelatin. On *agar-agar* at 20° C. a broad, smooth, greyish-white streak formed along the line of inoculation, and a scanty shreddy deposit in the water of condensation appeared in 2 days. *Broth* at 20° C. became cloudy in 2 days, and a small shreddy deposit settled to the bottom in the course of 10 days. *Microscopically:* the organism proved to be a small oval non-motile bacillus; it varied considerably in shape and size, both as regards specimens prepared from different culture media and as regards specimens from the same culture.

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Frequently it closely resembled a coccus. A bacillus, similar in its cultural characters and microscopic appearance, was found in several mackerel which I examined.

C. A *bacillus*, resembling the last one very closely in its cultural characters, was obtained from herring No. 2. Only a few colonies were present in the original gelatin plates. This bacillus resembled bacillus B. in growing at a temperature of 20° C. and being destroyed by a temperature of 37° C.; also in its mode of growth on agar-agar and in broth at 20° C. It differed in growing rather more freely on *gelatin streak*-cultures; a thickish greyish-white growth composed of confluent, small, round colonies forming at the end of 4 days. *Microscopically:* it proved to be a small regular bacillus with rounded ends and non-motile. A similar organism was also obtained from mackerel.

Mice fed freely on cultures of bacillus B. and C. were unharmed.

Proteus vulgaris.—There was only one kind of liquefying bacillus present, which proved to be the above organism. Of this there were only three colonies obtained by cultivation from herring No. 2, and about eight to ten similar colonies from herring No. 3.

Micro-organisms in Cooked Ham.

Cooked ham to the amount of about two pounds was bought in a shop. Cover-glass preparations from the juice which had exuded from its cut surface showed several rods, and cultures from this fluid yielded a large number of colonies of staphylococcus albus and a few colonies of proteus vulgaris.

Examination I. An incision was made into the depth of the ham by a sterilized knife, and cultures made on *gelatin*, on *agar-agar*, and in *broth* of the juice that exuded. These proved sterile.

Examination II. Cultures on *agar-agar* and *gelatin* were made in a similar way after the ham had been kept three days. Four varieties of colonies were obtained in considerable numbers. These proved on cultivation and microscopical examination to consist of—

(i.) Staphylococcus aureus: many colonies.
(ii.) Staphylococcus albus: a few colonies.
(iii.) Proteus vulgaris: a few colonies.
(iv.) A few colonies of a short motile bacillus, with rounded ends, sometimes showing bipolar staining, growing freely at 20° C. and 37° C. Isolated colonies on *agar-agar* at 37° C. had a peculiar resemblance to catherine-wheels in appearance. The organism liquefied *gelatin* fairly rapidly.

Examination III., on the 7th day, gave similar results.

Micro-organisms in Uncooked Bacon.

Three examinations were made of English (?) bacon bought in a shop. *Gelatin* and *agar-agar* cultures were made with juice from the central portions, and incubated at 20° C. and 37° C. respectively.

Examination I.

Fat yielded a few colonies of staphylococcus; aureus and albus.

Lean—Two *agar-agar* cultures at 37° C. yielded—

(i.) Staphylococcus albus: many colonies.
(ii.) Staphylococcus citreus: eight colonies.
(iii.) Four other colonies of various kinds.

Two *gelatin* cultures at 20° C. yielded—

(i.) Staphylococcus albus: many colonies.
(ii.) Staphylococcus aureus: a few colonies.

(iii.) Staphylococcus citreus: a few colonies.

(iv.) A few colonies of staphylococcus: non-liquefying, forming a thick, raised, white growth on *agar-agar* and *gelatin* sub-cultures.

(v.) A few colonies of an äerobic, facultative anäerobic, non-chromogenic, non-liquefying, non-motile bacillus. On *gelatin*, minute transparent colonies formed in 24 hours along the line of inoculation; the colonies became greyish-white and formed a coherent growth. On *agar-agar* at 37° C. moderate white growth and deposit developed. *Broth* at 37° C. became turbid in 24 hours, and a scanty stringy white deposit slowly settled *Microscopically:* the *gelatin* cultures showed short regular bacilli with rounded ends; on *broth* and *agar-agar*, long, thin bacilli, some a little curved, and long wavy threads and loops formed. Not pathogenic to mice.

Examination II.

Fat yielded several varieties of staphylococcus.

(i.) Staphylococcus aureus:—
  (*a.*) Pale yellow tint: liquefaction began in 2 days.
  (*b.*) Pale orange tint: liquefaction began in 2 days.
  (*c.*) Orange tint: liquefaction began in 24 hours.
  (*d.*) Deep orange tint: liquefaction proceeded very slowly.

(ii.) Staphylococcus albus.

(iii.) Another staphylococcus: non-liquefying, similar to the non-liquefying staphylococcus of the Lean in Examination I.

Lean yielded colonies of the same kind as those obtained from the fat, but in much larger numbers.

Micro-organisms in Uncooked Beefsteak.

Cover-glass preparations only showed cocci.

Three *agar-agar* cultures at 37° C. yielded only two kinds of colonies:—

(i.) Staphylococcus aureus, forming a pale yellow growth and liquefying gelatin rapidly.

(ii.) Staphylococcus albus, a variety liquefying gelatin slowly.

Four *gelatin* cultures yielded:—

(i.) Proteus vulgaris: several colonies.

(ii.) Staphylococcus aureus: a few colonies of the same variety as was obtained from the *agar-agar* cultures.

(iii.) Staphylococcus albus: a few colonies of the same variety as was obtained from the *agar-agar* cultures.

(iv.) A staphylococcus, non-liquefying: three varieties which all formed a thick white growth on gelatin sub-cultures varying in the depth of colour and, microscopically, as to size. All grew freely on *agar-agar* and in *broth* at 37° C.

Results as to the Ham, Bacon, and Beef Examinations.

Various forms of staphylococci were present in all, and in the case of the ham had not been entirely destroyed by boiling. The only bacillus at all common was the proteus vulgaris, though other bacilli were occasionally present, *e.g.*, in the ham and in bacon. These were harmless to mice when inoculated subcutaneously or administered by the mouth.

No. 8.

On the Diplococcus of Fraenkel and Weichselbaum; by Dr. Kanthack.

REPORT on the DIPLOCOCCUS of FRAENKEL and WEICHSELBAUM; by Dr. A. A. KANTHACK.

I.—GENERAL CONSIDERATIONS RESPECTING THE ETIOLOGICAL SIGNIFICANCE OF PNEUMOCOCCUS.

The diplococcus pneumoniæ (Fraenkel-Weichselbaum) is considered by most pathologists and bacteriologists to be the cause of croupous pneumonia, and thus has obtained the name of "pneumococcus." Briefly stated, some of the reasons for such belief are the following:—(1) It is found in almost all cases of croupous or lobar pneumonia; generally, if the expectoration be examined at the proper stage of the disease, in large numbers; (2) the rusty sputum of pneumonia, when inoculated into mice, guinea-pigs, or rabbits, causes a fatal septicæmia, the diplococcus, in its encapsuled form, being found in the blood of the experimental animals; (3) the animals of these species, if injected with heated or sterilised pneumonic expectoration, are rendered resistant to a subsequent inoculation with the diplococcus pneumoniæ; (4) the Klemperers have shown that the serum obtained from patients who have recovered from pneumonia will also render the above-mentioned animals proof against injection with the rusty sputum of pneumonia or with pure cultures of the pneumococcus.

On the other hand, it must be borne in mind that so far no one has succeeded in reproducing pneumonia, as it occurs in man, in experimental animals. Gamaleia and a few others do, it is true, claim to have succeeded; but their results are by no means unequivocal, as reference to their publications readily shows. Again, in some cases of undoubted pneumonia, croupous or fibrinous in type, the pneumococcus is absent from the exudation, and, on the other hand, this microbe is frequently present under conditions other than those involved in croupous pneumonia. Everybody, indeed, is agreed that this organism occurs in many inflammatory processes which generally have nothing in common with the fibrinous changes of pneumonia, and which are also not accompanied by the characteristic symptoms of that disease. Thus, some years ago it was shown that in many cases of otitis media (catarrhalis or suppurativa), in many cases of pleurisy or of empyema, and in frequent instances of infective endocarditis and non-tubercular meningitis this diplococcus is found, often in pure culture. Now some writers have attempted to distinguish by their clinical symptoms cases of what they considered pneumococcus-infection from seemingly identical pathological processes. This cannot be maintained as regards otitis media;* and as regards Dr. Washbourn's† recent statement that it is possible to differentiate pneumococcus-pleurisy or empyema from other pleurisy or empyema by the course of the fever, I must confess that I am unable to perceive sufficient warrant for such distinction in pleurisies which are unaccompanied by pneumonia, and speaking generally, whether I was observing an otitis or an endocarditis, a pleurisy, an empyema, a meningitis, or a peritonitis, I have never been able to detect any clinical symptoms which seem to single out those particular samples of the one or other malady associated with the pneumococcus. For instance, I have examined cases of pleurisy and empyema where, in the exudation and in the pus, as the case might be, pneumococci were present, occasionally in pure culture; and yet these cases in no respect differed clinically from ordinary forms of pleurisy or empyema.

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* Numerous papers by Zaufal: Prager med. Wochenschr, 1888 and 1889.

† Medico-Chirurgical Transactions, Vol. LXXVII., 1894, p. 185.

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Again, it has been asserted that the anatomical lesions associated with this diplococcus are characteristic, in that they are fibrinous in nature, after the type of the croupous inflammation in pneumonia. This also is not borne out by fact, for in many cases the microbe is associated with an acute exudative or serous inflammation, in others with an acute suppuration; and, on the other hand, true fibrinous changes may be associated with many organisms besides this pneumococcus, as, *e.g.*, with streptococcus pyogenes in ulcerative endocarditis, in membranous tonsillitis, or in broncho-pneumonia.

I am, therefore, convinced that it is impossible, either by clinical symptoms or by anatomical changes, to separate a special group of inflammatory processes as caused by this pneumococcus.

Now croupous pneumonia is undoubtedly a disease *sui generis*, one readily diagnosed by its symptoms and febrile course; and it seems, therefore, possible, that there may be here other factors besides the presence of the pneumococcus, which are responsible for the characteristic lesions and their accompanying symptoms. What these factors are, is mere matter for surmise; possibly they are special tissue idiosyncracies, or they may be concurrent infections, *i.e.*, processes produced by the association and interaction of diverse organisms.* The importance of "concurrent infections," is becoming more and more recognised, Dr. Klein's† researches especially having contributed many facts to, and thrown much fresh light on, this question. We know that the chemical and infective activities of many micro-organisms are altered (sometimes enhanced, sometimes repressed) if we inject simultaneously into the animal body diverse micro-organisms or their products. Thus, experimenting on dogs, the virulence of tetanus bacilli is greatly enhanced by inoculating concurrently with them pyogenic streptococci or such innocent organisms as the bacillus prodigiosus. It has always seemed to me that the question of specificity has been viewed too narrowly and artificially; that it is incumbent upon us to study closely the various effects produced on the susceptibility of the tissues, on the whole animal body, and on the pathogenic and toxic powers of particular organisms, by concurrent injection of diverse microbes. Whether or not pneumonia is to be referred to symbiosis in the above sense I am not yet in a position to decide; but I naturally regard the mere fact that the pneumococcus is found in almost every case of the disease as not sufficing to explain the pneumonic condition and the symptoms of pneumonia, if account is taken of all the other various and numerous processes in which the pneumococcus may and does occur. Nevertheless it is not to be denied that in pneumonia this diplococcus may have important concern, because in the more frequent complications of this disease, as, *e.g.*, in endocarditis, pleurisy, meningitis, &c., which are so common as almost to be considered symptomatic, the pneumococcus was generally present in the cases examined by me, often to the exclusion of other organisms. Possibly a thorough comparative chemical investigation of the tissues of pneumonia, on lines similar to those adopted by Dr. S. Martin in the case of diphtheria, may throw some light on the true relation of the pneumococcus to pneumonia.

But this much seems certain, that croupous pneumonia, so far as the anatomical changes are concerned, may be due to other organisms than the pneumococcus, *e.g.*, the bacillus of Friedländer,‡ and a bacillus resembling the bacillus or bacterium coli, separated and described by

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* Babes and Gaster. Annales de l'Inst. de path. et de bact. de Bucarest. 1890.

† Numerous papers in these Reports.

‡ Regarding the relation of this bacillus to the bacterium coli commune, see Ury Inaug. Diss, Strassburg, 1894, and Denys and Martin, La Cellule ix. 1893, Fasc. 1.

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Dr. Klein as the bacillus of Middlesbrough pneumonia. Of the latter form of croupous pneumonia I have no personal experience, for in all my cases the pneumococcus was found, even during influenza prevalence, so that I cannot say whether cases associated with other micro-organisms differ clinically from those I have observed. Weichselbaum draws anatomical distinctions between diplococcus-pneumonia on the one hand and staphylococcus or streptococcus-pneumonia on the other, the process being, according to him, more generalised and more fibrinous in the former, and more local and more exudative in the latter. These matters, however, so far as I am able to judge, are merely questions of degree and are not essential differences.

II.—Micro-organisms, Pneumococcus and other, associated with Umcomplicated Pneumonia.

Since Kruse and Pansini,* foremost amongst other writers, have drawn attention to the morphological and biological variability of the pneumococcus, it was deemed necessary at the outset of this research, to become personally thoroughly acquainted with the various forms of this organism. For this purpose a number of pneumonia cases were investigated. As a rule, the sputum was first of all examined before the crisis, while rusty, and examination of it was continued from day to day until convalescence had fairly begun. Whenever there was an opportunity of a post-mortem examination, cultivations were made from the lungs. In this manner a fairly large number of cases were examined, with results as follows :—

Table I.

No.	Pneumonia Case ; where and when observed.	Material examined.	Bacterioscopic result.
Case I. - -	Medical P.M., Nov. 14, 1898 -	Lungs - -	Pneumococcus. Bacterium coli commune.
Case II. - -	„ „ Nov. 15, 1898 -	Lungs - -	Pneumococcus. Staphylococcus albus.
Case III. - -	Matthew Ward, Nov. 17, 1898	Sputum immediately after crisis.	Pneumococcus. Staphylococcus albus. „ aureus.
Case IIIa. - -	Same case after death a few days later.	Lungs - -	Same organisms found.
Case IV. - -	Luke Ward, Nov. 24, 1898 -	Expectoration -	Pneumococcus. Staphylococcus aureus. „ albus.
Case V. - -	Medical P.M., Dec. 1, 1898 -	Lung (gray hepatisation).	Staphylococcus aureus. „ albus. Bacterium coli commune.
Case VI. - -	„ „ Dec. 10, 1898 -	Lungs - -	Pneumococci almost in pure culture.
Case VII. -	Luke Ward, Dec. 12, 1898 -	Sputum 14 days after crisis.	Pneumococcus found. (Other organisms disregarded).
Case VIII. -	„ „ „ „ -	Sputum 3 days after crisis.	„ „ „
Case IX. - -	„ „ „ „ -	Sputum 4 days after crisis.	„ „ „
Case X. - -	„ „ „ „ -	Sputum 3 days after crisis.	„ „ „

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* Zeitschrift f. Hygiene XI. 1891.

TABLE I.—*continued.*

No.	Pneumonia Case; where and when observed.	Material examined.	Bacterioscopic result.
Case XI.	Luke Ward, Dec. 12, 1893	Sputum 6 days after crisis.	Pneumococcus found. (Other organisms disregarded).
Case XII.	Medical P.M., Dec. 6 or 7, 1893.	Lung	„ „ „
Case XIII.	Medical P.M., Dec. 5, 1893	„	„ „ „
Case XIV.	„ „ Dec. 17, 1893	„	Pneumococcus. Staphylococcus albus. „ aureus.
Case XV.	Jan. 23, 1894	Sputum 4 days before crisis.	Same organisms.
Case XV*a*.	Same case as XV., Jan. 29, 1894.	Sputum after crisis.	„ „ „
Case XVI.	Jan. 24. 1894	Sputum 3 days before crisis.	Pneumococcus. (Other organisms disregarded.)
Case XVI*a*.	Same as XVI., Jan. 29, 1894	Sputum after crisis.	„ „ „
Case XVII.	Jan. 27, 1894	Sputum before crisis.	„ „ „
Case XVII*a*.	Med. P.M., same as XVII., Jan. 30, 1894.	Lungs	„ „ „
Case XVIII.	Med. P.M., Feb. 17, 1894	Lung	Pneumococcus. Staphylococcus albus. Bacterium coli commune.
Case XIX.	John Ward, Feb. 26, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus.
Case XX.	Medical P.M., March 13, 1894	Lung	Pneumococcus. Staphylococcus albus. „ aureus. Bacterium coli commune.
Case XXI.	Luke Ward, March 21, 1894	Rusty sputum before crisis.	Two varieties of pneumococcus (large and small colonies) when grown on agar.
Case XXII.	„ „ „ „	Rusty sputum before crisis.	Pneumococcus. (Other organisms disregarded.)
Case XXIII.	Mark Ward, „ „	Sputum before crisis.	„ „ „
Case XXIV.	Luke Ward, May 3, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus aureus.
Case XXV.	Medical P.M., May 25, 1894	Lung	Pneumococcus. Staphylococcus aureus. Bacterium coli commune.
Case XXVI.	John Ward, May 25, 1894	Sputum before crisis.	Pneumococcus (2 kinds). Staphylococcus aureus. Bacterium coli commune.
Case XXVI*a*.	Medical P.M., May 28, 1894, same as Case XXVI.	Lung	Pneumococcus. Staphylococcus aureus. „ albus Bacterium coli commune.
Case XXVII.	John Ward, May 25, 1894	Sputum before crisis.	Pneumococcus. Bacterium coli commune.
Case XXVIII.	Matthew Ward, May 29, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus albus. Bacterium coli commune.
Case XXIX.	„ „ May 30, 1894	Sputum before crisis.	Pneumococcus Staphylococcus albus. „ aureus. Bacterium coli commune

Table I.—*continued.*

No.	Pneumonia-Case; where and when observed.	Material examined.	Bacterioscopic result.
Case XXX.	John Ward, June 26, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus albus. Bacterium coli commune.
Case XXXI.	„ „ July 17, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus. Bacterium coli commune.
Case XXXII.	„ „ July 17, 1894	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus. Bacterium coli commune.
Case XXXIII.	„ „ July, 1894	Sputum before crisis.	Pneumococcus. (Other organisms disregarded.)
Case XXXIV.	Luke Ward, Jan. 10, 1895 Pneumonia in course of typhoid fever.	Sputum before crisis.	Pneumococcus. Staphylococcus aureus.
Case XXXV.	Luke Ward, Feb. 22, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus albus. Bacterium coli commune.
Case XXXVI.	„ „ Feb. 23, 1895	Sputum before crisis.	Same organisms.
Case XXXVI*a*.	„ „ Feb. 26, 1895	Sputum after crisis.	„ „ „
Case XXXVII.	John Ward, Feb. 25, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus.
Case XXXVII*a*.	„ „ Feb. 27, 1895	Sputum after crisis.	Same organisms and Bacterium coli commune.
Case XXXVIII.	Luke Ward, Feb. 26, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus, Bacterium coli commune.
Case XXXVIII*a*.	„ „ „ „	Sputum 4 days after crisis.	
Case XXXIX.	Medical P.M., Feb. 26, 1895	Lung	(*a*.) Cultures remained sterile; but (*b*.) Mouse inoculation yielded the pneumococcus.
Case XL.	Matthew Ward, Mar. 4, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus aureus. Bacterium coli commune.
Case XLI.	Mark Ward, March 12, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus. Bacterium coli commune.
Case XLI*a*.	„ „ March 16, 1895	Sputum after crisis.	
Case XLII.	„ „ March 12, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus aureus. Bacterium coli commune.
Case XLIII.	John Ward, March 26, 1895	Sputum at crisis	Same organisms.
Case XLIV.	Matthew Ward, May, 1895	Sputum before crisis.	Pneumococcus. Staphylococcus albus. „ aureus. Streptococcus pyrogenes.
Case XLV.	Mary Ward, May 29, 1895	Sputum before crisis.	Pneumococcus. St. pyog. albus. Bacterium coli commune.

Before discussing inferences from the above cases, a few words must be said regarding the method employed for the separation and identification of the pneumococcus. Gelatine plates being unsuitable and agar-agar plates inconvenient, I adopted agar tubes, three or four of which were in each instance inoculated as follows:—A stout platinum needle with a small loop was dipped into the sputum, tissue or pus, and with it three or four parallel streaks were made over the surface of the first tube. Then, without re-charging the needle, a series of parallel streaks were made over the surface of the second tube, and next over the surface of the third tube, and so on. The tubes were then placed in the incubator at 38·5° C. In this manner it was easy to obtain separate colonies of the various organisms present, and sub-cultivation became a matter of no difficulty.

In all instances cover-glass specimens were also made of the sputum, &c., in order to ascertain the number of organisms and the presence or absence, as regarded the pneumococcus, of a capsule. These specimens were stained with eosine and methylene blue, or by Gram's method, or according to other recognised methods for staining the capsule. Specimens stained with methylene blue alone and examined in water generally show the capsule, if present, very clearly; probably on account of the refractive difference being greater than when Canada balsam is used.

In all doubtful cases, experiment on animals, *i.e.*, subcutaneous inoculation of mice, was resorted to, with a view to making, after death of the animal, a careful examination of its blood and spleen, both microscopically and by means of cultivations. In this connexion, I may state at once that, working with pneumonic sputum, I hardly ever came across a case, at any rate, where the mouse did not succumb to an inoculation. In most cases, so long as I used sputum before the crisis, death occurred in from 24 to 48 hours, though in some cases it was delayed for three to four days. Again, in most cases, there occurred in the mouse a typical pneumococcus septicæmia, though occasionally the animal died showing merely local changes without a general bacterial infection. In these points my observations more or less confirm those of Kruse and Pansini. Experiments were also made to test the virulence of the sputum respectively before and after the crisis. But these have not yet been concluded, and are still insufficient in number; so I pass them over in silence, acquiescing merely in the statement that in some cases there is a decided diminution in the virulence of the pneumococcus after the crisis.

Certain Considerations arising in reference to the 45 Cases examined.

(1.) From the above table it is clear that, with a single exception, the pneumococcus was found in all the 45 cases of true croupous pneumonia that were examined. In Case V. alone, neither by cultivation nor by means of the mouse inoculation could the coccus be obtained. The lung was, however, in this instance, in a condition of so-called grey hepatisation, *i.e.*, it was breaking down, and the exception is therefore perhaps of no particular significance. As already stated above, I did not meet among the 45 cases with instances of Friedländer's bacillus or of Klein's Middlesborough organism.

(2.) The pneumococcus was never found by me absolutely in pure culture, either in the sputum or in the lung tissues; invariably it was in combination with other micro-organisms; and these associated bacteria were in some cases so numerous that it required long and laborious search before any pneumococci could be discovered. In some instances the former were not especially scrutinised; on account of pressure of work, I had to be satisfied with separating the pneumococcus alone. The organisms most commonly found in conjunction with the pneumococcus were (*a*) staphylococcus pyogenes albus, (*b*) staphylococcus pyogenes aureus, and (*c*) bacterium coli commune. It will be seen that as the work progressed the latter was almost always obtained; it was only during the first few weeks that I failed to get it, and this I attribute to my want of experience, because it was not till February 1894 that I became familiar with Dr. Klein's methods and tests for the detection of the particular organism. The constancy with which one finds the pyogenic staphylococci and this bacterium is most striking, and personally I feel convinced that the association of these micro-organisms in the tissues of pneumonia cannot be quite without importance. But whether there is an interaction, and what is the effect of this association of microbes, must be left for future research.

[At first I imagined that the bacterium coli—this term includes varieties of the organism*—was perhaps especially associated with the pneumococcus in pneumonia, and possibly in other pneumococcus-infections. I therefore made independent observations of this organism, and found that it is undoubtedly the most "ubiquitous" germ within and without the body. I have separated it from: (*a*), all sorts of sputa, whether phthisical, influenzal, bronchitic, or pneumonic; (*b*), from the saliva of healthy individuals; (*c*), from fœtid urine; (*d*), from the vaginal and cervical uterine secretions; (*e*), from diphtheritic membranes; (*f*), and from all gangrenous, necrotic or sloughing ulcerations, such as true senile gangrene, cancrum oris, phagedena, epitheliomata, and so forth: also I have found it (*g*) almost always in intestinal and intra-abdominal affections, as well as (*h*)—and this seems striking, if my methods are reliable—in the liquor amnii just before delivery.† Outside the body the bacterium is to be found almost everywhere, as, for instance, in dust, soil, and rain-water collected in the square of St. Bartholomew's Hospital; I also found it in ice chambers containing frozen mutton and on the frozen surface of the carcasses. My observations of this microbe will be published elsewhere when completed. I mention them here in view of the question of the bacterium coli having a more or less special action in pneumonia, and because this bacterium has, by many writers, been almost specifically associated with various suppurative processes, *e.g.*, hepatic abscesses. My results lead me to believe that, having regard to the wide diffusion of this organism, there cannot be a question of its more or less specific action in pneumonia, whatever may be its concern with other diseases, but that the organism may be a factor in the disease, cannot be denied. What is the true importance of this bacterium requires more extended research to settle.

Similarly I am unable to offer any kind of explanation or suggestion as to the concurrence of the various pyogenic organisms found by me in pneumonic sputa and tissues. I should have mentioned that from the above list all common saprophytic organisms, as, *e.g.*, sarcinæ, yeasts and proteus forms have been omitted. The proteus forms may however be of importance on account of their septic chemical products.]

Pathological Effects of Pneumococcus.

In my search for tissue reactions produced by the pneumococcus, I have examined for fibrin a large number of pneumonic lungs (in the condition of red hepatisation and consolidation) by means of Weigert's well-known method, and I find that there is a great variability as to its formation. Sometimes the lung-alveoli are entirely filled with fibrin, at other times it is found only sparsely; but some fibrin there practically always is, so long as examination is made at a suitable time. Fibrin-formation, however, is by no means a specific reaction produced by the pneumococcus. Foà and Carbone* have described two varieties of pneumococcus — "fibrinogenetic" and "œdematogenetic" varieties; producing respectively a fibrinous inflammation and an œdematous exudative process. The œdematogenetic variety, they say, produces chiefly local changes, and causes only limited blood infection, if any, while the fibrinogenetic variety causes a typical blood infection. This would be an important distinction, and worthy of full consideration in the study of the various lesions produced by the pneumococcus; but in accordance with Marchiafava and Bigami,† I find, that this distinction is an artificial one, and depends on the virulence, age of the cultures, and so forth; and it appears to me that Kruse and Pansini have also come to this conclusion. I found repeatedly that a pneumococcus obtained from a typical case of fibrinous pneumonia would, when injected into the thigh of a guinea-pig, produce not much more than local suppuration and œdema, and that mice thus dealt with died often without showing any, or hardly any, cocci in their blood and spleen. Indeed, the pathological effects produced by a subcutaneous inoculation with the pneumococcus, however derived, vary considerably: (1.) In some cases there is chiefly intoxication, *i.e.*, local inflammation, œdema, or suppuration, resulting in death of the animal when often no organisms are found in the blood. (2.) In other cases there is a typical septicæmia, *i.e.*, a hæmic infection. These are the two types of morbid lesions met with in my observations: as was the experience of Kruse and Pansini. But I find, moreover, that the same organism may bring about either result, and that the particular lesion produced is no criterion for drawing definite distinctions. (3.) In a few cases an inoculation with rusty sputum or with pure culture of the pneumococcus was followed by severe acute febrile disturbance, the animal being apparently in a dying condition, from which, however, it eventually rallied, being then *immune* against lethal doses.

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* These varieties I have not worked out, and their differentiation must be left for a future study.

† See also a paper by Dr. A. Gilbert on "colibacillosis." The "Medical Week," January 11th, 1895, p. 13.

Cultural Features of Pneumococcus.

The instability, culturally, of the pneumococcus has already received due, or, I might say, undue, attention from Kruse and Pansini. It is certain that the samples of pneumococcus separated from various cases of pneumonia differ greatly from one another as regards growth on agar-agar, in warm gelatine, in broth, and in milk.

(1.) *Growth on agar-agar:* I have been able to distinguish two chief types, according to the appearance of the colonies, on the surface of nutrient agar-agar, viz., the growth presents itself in the form of (*a*), very small, punctate transparent colonies, the latter being very discrete and showing no tendency to fuse together; and (*b*), larger, flat almost colourless and transparent colonies, often recognised with difficulty on account of their thinness and transparency. The difference is as striking as it is difficult to describe, but in regard to virulence I have not been able to draw any distinction between these two forms, and, also, it is possible for one variety to change into the other without any assignable reason, or for both forms to occur simultaneously in cultures from one and the same case. I am not alluding here to such slight differences (*e.g.*, opacity, size of colonies, &c.) as have been well described by

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* Gazetta Medica di Torino, 1891, No. 15.

† Rif. med. 1892, 251 and 252.

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Kruse and Pansini, and which do not seem to me to be essential or even permanent.

(2.) *Growth in warm* 12°/₀ *gelatine at* 38° C.: In most cases the gelatine remains clear, and the culture appears as a tenacious, white, mucoid growth, either floating in the gelatine or sinking to the bottom of the tube. In some instances the gelatine became turbid or the growth was more granular. In most cases the growth was copious, in others scanty, and in a few absent altogether.

(3.) *Growth in nutrient broth:* Here, again, two types may be distinguished, viz., either the broth becomes turbid, or it remains clear with a granular or tenacious sediment collected on the bottom of the tube. The turbidity may be either slight or well marked.

As far as the growth in gelatine or broth is concerned, I have also noticed that pneumococci from the same source may at one time conform to one type and at other times to another: there is no uniformity.

(4.) *Growth in milk:* In most cases milk was not coagulated; but when this occurred it might take place either quickly or slowly. Some samples, which at one time refused to cause the milk to clot, sooner or later acquired the power of doing this; and *vice versâ.* Here again there was no constancy. A similar inconstancy in this respect may be noted with other organisms, as observations which are being conducted at the present time clearly show. Thus the bacillus prodigiosus may acquire this power or may lose it; indeed, power to coagulate milk is with many bacteria an extremely unstable character.

It is of great importance to remember that there are all these diversities of behaviour of the pneumococcus, for thus only is one secured against error.

Microscopical Features of Pneumococcus.

Of especial value is the microscopic examination, in so far as it is directed to detection of the presence of the capsule. Since much has been written on this question I can be brief. In my examinations I have always considered the existence of the capsule a *sine quâ non* in these cocci derived directly from the animal body. The cocci may be arranged in pairs or in small chains. In liquid media or in the condensation water they often develop into streptococci without capsules, and even when they remain diplococci they almost invariably lose their capsules. The non-capsulated chains, if they appear, may be either long or short; but these chains when injected into an animal must acquire once more the characteristic clear and refractive capsule. The cocci themselves may be round, oval, or lanceolate; a hard-and-fast line between form and virulence I have not been able to draw. Foà distinguished between a pneumonia-diplococcus and a pneumonia-streptococcus, but such distinction is not justifiable, pneumococcus or streptococcus pneumoniæ being undoubtedly the best designations for this pleomorphic organism, the diplococcus being the simplest type of the chain.

I am conscious that much, if not the greater part of what has been said in the previous pages is more or less well-known matter, but an independent investigation on my part was necessary, and I have stated the results, even at the risk of mere repetition. For this reason, however, the above remarks have been kept as succinct as possible.

A table is appended to show the differences of growth in milk, broth, and liquid gelatine, exhibited by different samples of pneumococcus.

TABLE II.

No.	Milk.	Broth.	Gelatine.
(1)	No coagulation	Sediment; broth clear	Thick white viscid sediment; gelatine clear.
(2)	No „	„ „ „	„ „ „
(3)	Very slow coagulation.	—	—
(4)	No coagulation	Same as (1)	Extremely copious growth; gelatine clear.
(5)	No „	—	—
(6)	No „	Sediment and turbidity.	—
(7)	Rapid „	—	—
(8)	Slow „	—	—
(9)	No „	Same as (6)	Slight growth; gelatine clear.
(10)	No „	Sediment; slight turbidity	Same as (1).
(11)	No „	Same as (6)	Same as (1); more copious growth.
(12)	Slow „	—	—
(13)	No „	Powdery sediment; broth clear.	Copious growths; same as (1); gelatine clear.
(14)	No „	„ „ „	„ „ „
(15)	Slight coagulation after 8 days.	Same as (6)	Slight sediment; gelatine clear.
(16)	Coagulation after 8 days	„ „ „	„ „ „
(17)	No coagulation	—	—
(18)	No „	Broth turbid	Slightly turbid.
(19)	Slow „	Clear	Flocculent growth; gelatine clear.

III.—MICRO-ORGANISMS, PNEUMOCOCCUS AND OTHER, ASSOCIATED WITH SEQUELÆ OF PNEUMONIA.

I now pass to the consideration of the relation of the pneumococcus to morbid conditions arising in the course of, and as sequelæ to, pneumonia; afterwards I shall go on to the consideration of the occurrence of this organism in lesions which etiologically or pathologically are independent of pneumonia.

TABLE III.

No.	Malady; where and when observed.	Nature of Lesion.	Bacterioscopic result.	Remarks.
Case I.	Medical P.M., Nov. 14, 1893.	Ulcerative endocarditis.	Pneumococcus Staphylococcus albus. „ aureus.	See Case I., Table I.
Case II.	Medical P.M., Nov. 14, 1893.	Purulent peritonitis.	Pneumococcus. Bacterium coli commune.	
Case III.	Medical P.M., Nov. 24, 1893.	Œdema of larynx	Pneumococcus (pure)	See Case IV., Table I.
Case IV.	Medical P.M., Dec. 10, 1893.	Empyema	„ „	See Case VI., Table I.
Case V.	Medical P.M., Dec. 6, or 7, 1893.	Pericarditis (purulent).	Pneumococcus (pure)	See Case XII Table I.
Case VI.	Medical P.M., Dec. 6, or 7, 1893.	Peritonitis	„ „	

TABLE III.—*continued.*

No.	Malady; where and when observed.	Nature of Lesion.	Bacterioscopic result.	Remarks.
Case VII. -	Medical P.M., Dec. 5, 1893.	Pericarditis -	Pneumococcus (pure)	See Case XIII., Table I.
Case VIII.	Medical P.M., Dec. 5, 1893.	Pleurisy -	„ „ -	
Case IX. -	Medical P.M., Dec. 5, 1893.	Peritonitis -	„ „ -	
Case X. -	Medical P.M., Dec. 17, 1893.	Post-pneumonic abscesses in lungs.	„ - - Staphylococcus albus. „ aureus.	See Case XIV., Table I.
Case XI. -	Medical P.M., Mar. 13, 1894.	Empyema -	Pneumococcus - Staphylococcus albus and aureus.	See Case XX., Table I.
Case XII. -	Medical P.M., Mar. 13, 1894.	Endocarditis -	Pneumococcus - Staphylococcus albus. „ aureus.	
Case XIII.	Medical P.M., Mar. 13, 1894.	Fibrinous meningitis -	Pneumococcus - Staphylococcus albus and aureus.	
Case XIV.	Medical P.M., May 28, 1894.	Ulcerative endocarditis.	Pneumococcus - St. p. albus - - „ aureus - - Bacterium coli commune.	See Case XXVI., Table I.
Case XV. -	Medical P.M., May 28, 1894.	Meningeal fluid -	Pneumococcus (pure)	

From this list it is seen that in certain ordinary inflammatory complications or sequelæ of pneumonia, the pneumococcus is generally present. In pleurisy, empyema, pericarditis, or even peritonitis secondary to pneumonia, it is easy to assume that the infection has spread from the lung to the neighbouring structures. But it is interesting to note in comparing the two Tables I. and III., that, although in many instances several diverse organisms were found in the lung or in the sputum, the pneumococcus was obtained in pure culture, or at any rate in almost pure culture, in the secondary processes. This, though it may indicate that for post-pneumonic processes the pneumococcus is of special importance, throws no light on the question of the specificity of this coccus in pneumonia. In certain infective diseases we find, occasionally, secondary lesions seemingly due to superadded infection, as has been shown by Dr. Klein in regard of typhoid fever, pyogenic cocci in the blood or in the spleen being found by him in several fatal cases of that disease. Similar observations are constantly made too in small-pox as to pyæmic or septic changes in its later stages produced by streptococci. Nevertheless it remains a striking fact that, in pneumonia the organism most frequently found in the sputa and lungs is the pneumococcus, and that the organism almost invariably found in the complicating lesions is also the pneumococcus. Often enough, of course, other organisms were also found in these lesions, as, *e.g.*, the pyogenic staphylococci, or even the bacterium coli commune, which occur also in the primary seat of inflammation—the lung. Hence it would seem that when dispersion of organisms from the lung occurs, the pneumococcus may find its way into distant tissues, alone or accompanied by other organisms which occur in the lung together with it, and it is difficult to understand why in certain cases, in which the pneumococcus is in association with other organisms in the lung, this coccus alone is found in the secondary lesions. Whether this be due to differences of predisposition of the individual or of certain of his tissues the fact is not

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a new one. Dr. Klein's experiments on the effects of concurrent inoculation show that when two micro-organisms are injected into an animal, one of them only may become diffused through the tissues. Also we know that if we inject anthrax bacilli and bacillus pyocyaneus simultaneously into the ear-vein of a rabbit, the animal will die of a double infection, whereas if the mixture be injected into the anterior chamber of the eye no infection results, but on the contrary, an immunity from anthrax is obtained, notwithstanding that the animal is highly susceptible to both infections.

With regard to the interaction of microbes, I have occasionally found on injecting into mice 0·5 c.c. of material rich in pneumococci, such as sputum or pus, that the animals did not die, apparently on account of the contaminations present in the pus or sputum, for, as soon as I used, instead, a pure culture of the pneumococcus artificially grown from the material, the animals died quickly. Also occasionally, on injecting sputum which contained both the bacterium coli and the pneumococcus under the skin of a mouse, the animal succumbed to a bacterium-coli-septicæmia, no pneumococci being found in the blood: nevertheless, the pneumococcus injected in pure culture was deadly enough, and occasionally the bacterium coli injected alone did not necessarily cause fatal result. On one occasion, on injecting pneumonic sputum into a mouse, the animal died of a double infection with pneumococcus and staphylococcus aureus: under ordinary conditions, as is well known, it is difficult to cause in the mouse a general infection with this staphylococcus. Double infections with pneumococcus and the bacterium coli were observed on several occasions on inoculating relatively large doses of sputum into the mouse. This interaction and counteraction of microbes, then, is an exceedingly difficult problem, and at present not fully, if at all, understood.

Apart from pneumonia itself then, the pneumococcus is found in lesions which are secondary to pneumonic lesions, which may be either proximal (pleurisy, empyema, pulmonary abscesses, *peritonitis*) or distal (endocarditis, meningitis). When they are distal, the organisms have probably been carried to the tissues by the circulation, and for this reason it is always of importance to examine the blood in pneumonia by means of cultivations when there is a protraction of the febrile symptoms, or whenever secondary remote infections are suspected. My own observations on this point are not numerous enough to be recorded here; but in several cases after death I have found pneumococci in the spleen, even when there was no endocarditis. In these remote lesions, just as in the case of the proximal lesions, we find either the pneumococcus alone or this micro-organism in combination with others.

Now, as to the anatomical or histological changes produced at the site of secondary lesions there is noticed also great diversity. In the case of endocarditis there is a marked development of fibrin, but when an infection of a serous cavity is in question, such as of the pleural, peritoneal, or meningeal cavities, though often fibrinosis occurs, suppuration is more common, and in some instances there is a serous inflammation only. It appears, then, that outside the lung the pneumococcus may produce (*a*) fibrinosis, (*b*) suppuration, or (*c*) exudation, *i.e.*, diverse processes of inflammation; and often enough there are in the lung fibrinous changes, while at the same time the complicating pleurisy or meningitis is purulent. It is certainly wrong to assert, as is often done, that the secondary changes are necessarily charcterised by fibrinous or plastic changes. On closely studying these secondary affections, the clearest insight into the diversity of lesion referred to the pneumococcus is obtained: it may be pyogenic, or "fibrinogenetic," or "œdematogenetic"—if I may use the last two uninviting terms. Moreover, the three effects may be recognised in one and the same body, as associated with the processes of one and the same organism, so that Foà's opinions as to two distinct varieties (fibrinogenetic and œdematogenetic) are not to be accepted.

IV.—MICRO-ORGANISMS, PNEUMOCOCCUS AND OTHER, ASSOCIATED WITH MALADIES ON WHICH PNEUMONIA SUPERVENED.

So far, I have considered morbid lesions associated with the pneumococcus, referred to the direct or to the remote effect of a pneumonic infection in the lungs. The pneumonia was in each instance the first process, and was followed by endocarditis, by pleurisy, by peritonitis, or by meningitis.

Now, there are a few rare cases where the pneumonia appears to be secondary to a pneumococcus infection elsewhere. Thus I have come across cases where an otitis media and a meningitis respectively were the primary maladies, and where later in the course of the disease typical pneumonia appeared. These cases are of extreme interest, as possibly throwing light on the etiology of pneumonia.

TABLE IV.

No.	Where and when observed.	Disease.	Tissue examined.	Bacterioscopic result.
Case I. -	Mark Ward, Mar. 21, 1894.	Otitis media purulenta, followed by pneumonia.	Sputum. - [Ear discharge not obtainable.]	Pneumococcus.
Case II. -	Elizabeth Ward, Mar. 8, 1894.	Meningitis; afterwards pleurisy and pneumonia.	Pleuritic fluid.	Pneumococci (pure).
			Sputum.	Pneumococci and staphylococci.

The second case was admitted into the ward as "tubercular meningitis," and of the existence of meningitis there could be no doubt. Subsequently, when pleurisy developed and an exploratory puncture was made, the clear serous fluid which exuded was sent to my laboratory. Both microscopically and experimentally, by means of cultivation and inoculation, the exclusive presence of pneumococcus was readily established. Later, pneumonia appeared. The occurrence of meningitis during the course of pneumonia is hardly a very uncommon event, at least judging from post-mortem records; but it is rare, so far as my, perhaps limited, experience goes, to find the order of things reversed. Both the above cases recovered, and hence, anatomical examination of them was out of the question; but even without this they give further proof of how futile it is to speak of a "fibrinogenetic" and of an "œdematogenetic" variety of the pneumococcus, for in one case the same organism was associated in the middle ear with suppuration and in the lung with fibrinous or croupous inflammation. Moreover, the morbid anatomist may remind the bacteriologist that the fibrinous changes almost invariably found in the pneumonic lung itself may be surrounded by an acute inflammatory œdema at the outskirts: in fact, the pneumonic lung affords one of the best instances of so-called inflammatory œdema.

App. B. No. 8.

On the Diplococcus of Fraenkel and Weichselbaum; by Dr. Kanthack.

V.—Micro-organisms, Pneumococcus and Other, associated with Maladies altogether independent of Pneumonia.

I now come to the consideration of cases where an infective lesion is associated with the pneumococcus without any relation of the malady to pneumonia; where the pneumococcus, either alone or in combination (or concurrence) with other "specific" organisms, is found within the tissues in the course of other diseases. I may state at once that this field has already been widely worked by others, and that perhaps I have little or nothing to add which has any claim to novelty or originality. The pneumococcus literature is so extensive that I must be forgiven for not alluding in this connexion to all the researches of others.

Some years ago, after Zaufal, Moos, Gradenigo, Netter, and Rohrer had shown that in many cases of otitis media acuta the pneumococcus appears in the tympanic cavity, I examined a series of cases, and also found the pneumococcus present in a large proportion of them; rarely in pure culture, generally together with pyogenic staphylococci.* In chronic cases I never found pneumococci, but in so-called catarrhal inflammations of the tympanic cavity the pneumococcus was detected by me in one case. I am, as I have said, convinced that there are no clinical differences between an otitis media associated with a pneumococcus and an otitis media referred to a streptococcus as was once assumed or suggested by Zaufal. When this malady spreads to the mastoid process or antrum, pneumococci will be found there also, if they were present previously in the ear.

Weichselbaum and Netter have adduced evidence that in the majority of instances of cerebro-spinal meningitis (in the epidemic form especially) the pneumococcus is the infecting agent. The coccus has been found not so very infrequently in pleurisy, pericarditis, endocarditis, meningitis, peritonitis, arthritis, tonsillitis, inflammations of the nasal antra, of the ear, bone and periosteum, in abscesses and phlegmonous lesions, but according to Boulay† it does not in man produce a general infection. Amongst the rarer lesions with which this organism may be associated, this same author mentions angina Ludovici, parotitis, and liver abscesses. The pneumococcus, therefore, would seem capable of infecting almost any tissue primarily, and of being concerned therein with many different forms of inflammation—exudative, fibrinous, phlegmonous, suppurative, or necrotic. These considerations are of some importance, since recently‡ attempts have been made to narrow and limit our conceptions of inflammatory reactions by an abuse and misuse of the term "specific." Thus, it has been stated that erysipelas is a *specific* disease produced by a *specific* streptococcus, and that the specific character of this coccus consists in the circumstance that when inoculated into man or other animal it produces erysipelas. Other organisms cannot, it is said, produce erysipelatous inflammations. Now, this notion, as Janowski has shown, is no longer tenable; for, experimentally, (*a*) the erysipelas coccus may produce suppuration, often necrosis, *i.e.*, it does not invariably produce erysipelas; (*b*) other organisms can and do produce lesions in man which clinically cannot be distinguished from erysipelas, and which every surgeon would pronounce to be erysipelatous. Erysipelas is a clinical term, and that it must remain; but if we wish to make it a pathological term as well, then no inflammation should be called by that name unless a bacteriological examination has demonstrated the presence of the streptococcus. It is seen, therefore, that *identical* anatomical lesions, so far as we can judge, may be produced by *unlike* organisms, and so, here to speak of a recognisable difference between staphylococcus pus and streptococcus or pneumococcus pus is not warranted. The facts must be accepted (1) that the same organism may act differently according to unknown laws and conditions, and (2) that diverse organisms may produce the same or almost identical results—so far as the limitations of our senses and instruments allow us to judge. Just as the pneumococcus appears concerned in various inflammatory processes, so, too, pyogenic streptococci are related to erysipelas, phlegmon, abscesses, and suppuration, fibrinous inflammations (membranous tonsillitis, &c.), and septicæmia, &c.; while infective endocarditis, a clinical unit, appears to result indifferently from streptococci, from pneumococci, from staphylococci, &c.; malignant pustule, again, may be due to anthrax bacilli or pyogenic streptococci. Where the toxic substances manufactured by particular organisms are highly specialised in their physiological action, there we can draw hard-and-fast lines, as, *e.g.*, in the case of tetanus and post-diphtheritic palsies; but where the poisons are less specialised, there our limited perceptions prevent us from being able to draw such distinctions. Just as the effect of the various strong mineral acids on the tissues, so far as we can observe, is the same however great the difference in the chemical composition of these acids, in the same manner certain groups of organisms may produce toxins entirely different in their constitution, yet possessing similar, and for us identical, physiological actions. I shall not pursue this subject further. We must see, however, that caution is always necessary in the choice of our terms, and that an inadequate term is worse than none at all. So far as the pneumococcus is concerned, then, it is not "specific" either in its physiological action or as the essential cause of pneumonia. It should not be forgotten, moreover, that Netter,* whose authority in this question no one would doubt, found the pneumococcus frequently present in broncho-pneumonia; out of 53 cases, 15 times in pure culture and 12 times in combination with other organisms; and in a second series of observations, out of 42 cases, 10 times in pure culture and 19 times in combination with other organisms. My own observations on this subject are not completed yet, and I will therefore not allude to them, beyond noting that on the whole they agree with Netter's. Baumgarten† remarks that in broncho-pneumonia the lung alveoli are generally occupied by fibrin and cells. This is true, as my own numerous observations have taught me; but this fibrin appears whether we are dealing with pneumococci or with pyogenic cocci. Moreover, broncho-pneumonia is essentially different from pneumonia, clinically as well as pathologically and anatomically, and yet the pneumococcus is frequently found in it.

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* Zeitschrift f. Ohrenheilkunde, 1891, Vol. XXI.

† Des affections à pneumocoques indépendentes de la pneumonie franche. Paris, 1891.

‡ Med. Chirurgical Society, May, 1895.

I shall now proceed to enumerate my own observations of pneumococcus infections independent of pneumonia.

TABLE V.

No.	Where and when observed.	Lesion.	Bacterioscopic result.
Case I.	Medical P.M., Oct. 26, 1893	Cerebro-spinal meningitis.	Pneumococcus (numerous) (killed mice, but not rabbits). St. pyog. albus (scanty).
Case II.	Luke Ward, Nov. 29, 1893	Diphtheria	Diphtheria bacillus Pneumococcus } in membrane.
Case III.	Medical P.M., Oct. 29, 1893	Diphtheria	Pneumococcus (pure culture). in bronchial glands.
Case IV.	P.M. on Monkey, Dec. 11, 1893	Peritonitis purulenta.	Pneumococcus (pure culture).

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* Archives de méd. exp. et d'anatomie pathol., 1892, no. 1.

† Baumgarten's Jahresberichte, vol. viii., p. 55.

TABLE V.—*continued.*

No.	Where and when observed.	Lesion.	Bacterioscopic result.
Case V. -	Medical P.M., Feb. 14, 1894 -	Cancrum oris - Otitis media purulenta. Septicæmia -	Cheek: Pseudo-diphtheria bac. Bac. coli commune. Pneumococcus. St. pyog. aureus. „ „ albus. Ear: Pneumococcus. Staphylo. pyog. aureus. „ „ albus. Blood: St. pyog. albus. „ „ aureus. Pneumococcus.
Case VI. -	Medical P.M., March 23, 1884	Empyema of frontal and ethmoidal sinues with meningitis purulenta.	Empyemata: pneumococcus (pure culture). Meningitis: pneumococcus (pure culture).
Case VII. -	Medical P.M., March 13, 1894	Fibrinous meningitis.	Pneumococcus. Staph. pyog. albus.
Case VIII.-	Medical P.M., May 21, 1894 -	Ulcerative endocarditis.	Pneumococcus (pure culture).
Case IX. -	Medical P.M., April 1, 1895 -	Hæmorrhagic diphtheria; septicæmia.	Spleen: Pneumococcus (pure culture). Brain and meninges: Pneumococcus. St. py. albus. „ „ aureus. *See* below. Ear: Pneumococcus. St. p. albus and aureus. Diphtheria bac. Heart: Pneumococcus (pure culture).
Case X. -	Medical P.M., May 1895 -	Cynanche cellulaire (ang. Ludovici).	Neck and pharynx: Large numbers of pneumococci and many other organisms (*v. infra*). Spleen: Encapsuled diplococci microscopically - cultures failed.
Case XI. -	Matthew Ward, May 1895 -	Pleurisy (no pneumonia).	Pneumococcus (pure culture).
Case XII. -	Luke Ward, May 1895 -	Empyema (no pneumonia).	Pneumococcus. St. pyog. albus. „ „ aureus.
Case XIII.	Medical P.M., May 27, 1895 -	Empyema. Purulent pericarditis. Otitis media purulenta.	Pneumococcus. St. pyogenes albus and aureus.

Unfortunately my list is small, a circumstance due to my unavoidable absence from work from July 1894 to January 1895. Yet it includes a few interesting facts. The most noteworthy case is Case IX. This was a child, admitted into Radcliffe Ward for diphtheria where it was treated with Dr. Klein's anti-toxin. It did well, but, when on the road to recovery, suddenly developed a petechial or purpuric eruption, and soon died with symptoms of acute blood poisoning. This was a case of so-called "hæmorrhagic diphtheria." I examined the blood just before death, and found the pneumococcus. The post-mortem examination revealed: (*a*) otitis media, (*b*) œdematous meningitis, (*c*) a large spleen, (*d*) a broken-down purulent thrombus in the left auricle. The result of the bacteriological examination is stated above. It is well known that the mortality of hæmorrhagic diphtheria is, in spite of the anti-toxin treatment, appalling—in fact, the anti-toxin does not affect it—and if we are permitted to judge from this one case, it seems that the appearance of the hæmorrhages is due to septicæmia, a secondary infection, against which, of course, the anti-toxin is powerless. All cases of so-called hæmorrhagic diphtheria should be examined *intra vitam* for the presence of micro-organisms in the blood, and *post mortem* for the presence of micro-organisms in the organs. The pneumococci, separated in this case from the spleen, ear, heart, and meninges, were extremely virulent; they killed mice, guinea-pigs, and rabbits in 18–36 hours, and in the blood and tissues of these experimental animals typical encapsuled pneumococci were found. No doubt other micro-organisms are also capable of causing septic infection in diphtheria. Claisse,* in 1891, described a case of purpuric petechial hæmorrhages, caused by a pneumococcus infection during the course of endocarditis and pneumonia. The spleen was enlarged, and, as in my case, contained numerous pneumococci. In this organ they were so plentiful that they could be readily detected by means of coverglass specimens. This observation on hæmorrhagic diphtheria seems to me to be of importance and to open up further studies and investigations.

Of importance also is Case X. (Cynanche cellulaire or angina Ludovici). The patient was admitted into St. Bartholomew's Hospital, and soon died of an acute septic infection, the result of the angina. The cellular tissue of the neck was phlegmonous and in parts infiltrated with pus, the mucous membranes of the pharynx and larynx were œdematous and phlegmonous. In the pus a large number of micro-organisms were detected, but the preponderance of the diplococci was striking. Similarly, in the tissues of the pharynx, encapsuled diplococci were almost exclusively found by means of sections. In the enlarged spleen pneumococci were present in sufficient number to be easily seen microscopically in film preparations. A mouse inoculated with the pus from the tissues of the neck survived; but other mice, inoculated under the skin with the pneumococcus obtained in pure culture from the pus, died in 18–24 hours, when examination of their blood and spleens revealed the presence in abundance of the typical pneumococcus. The pathology of angina Ludovici has led to much discussion, and this case, therefore, is of the more importance: especially when we consider at the same time a case mentioned in Table I. (No. IV.), where an infective œdema of the larynx developed during the course of pneumonia, and where the pneumococcus was also found. In three other cases of this malady previously examined by myself, pyogenic streptococci and staphylococci had been found.

Later, or rather recent, observations of my own show that pneumococci in diphtheritic membranes and in discharges from the throat in diphtheria, are not exactly rare, though, of course, by no means so common as other streptococcus forms. This point, in connexion with the hæmorrhagic diphtheria case detailed above, appears to me to be of some significance, as also the fact that in a case of diphtheria in a child pneumococci were found in the enlarged bronchial glands.

Like others, I have paid special attention also to the bacteria found in pleurisy and empyema, although in the above list I have enumerated only three cases. Altogether, however, 12 samples of serous pleuritic exudation were examined by me which had been removed from patients who were free from pneumonia. These have not been included in the above list because no special record had been kept as to ward, date, and other conditions. However, these few observations of mine agree almost entirely with Jakowski's; so that I need merely refer to his conclusions, which were published in 1892, and abstracted in Baumgarten's "Jahresberichte" for 1892 (Vol. VIII, pp. 56 and 57), and mention that in a large majority of the cases the pneumococcus was found, either alone, in pure culture, or in association with other micro-organisms; and that in all such cases the pneumococcus of the pleurisy was to begin with as virulent as the pneumococcus of pneumonia generally is. Clinically these cases of pleurisy presented no special symptoms, so that Washbourn's cases must be regarded rather as anomalies than the general rule.

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* Archives de méd. exp. et d'anat. pathol. 1891.

Again, I need not allude to the presence of the pneumococcus in cerebro-spinal or cerebral meningitis: this is too well known to need further repetition. Of course it must be understood that in many cases of non-tubercular meningitis, other micro-organisms, as, *e.g.*, streptococci, staphylococci, &c. are observed; yet, judging from a limited number of examinations, I must confess that the pneumococcus occurs decidedly frequently in intracranial inflammations.

The list of cases (Table V.) given above does not require further comment; it confirms the results of other observers, viz., that the pneumococcus, generally in association with other micro-organisms, is frequently found in the most diverse conditions, arising independently of pneumonia and differing in their nature and character essentially from pneumonia.

I need not lay stress on the facts that the pneumococcus has been frequently found in healthy secretions from the mouth, pharynx, and nose, and from the bronchi. My own observations on this point afford nothing new.

SUMMARY.

The facts I have adduced in this report suffice to indicate that a complete solution of the nature of the various forms of "pneumococcus infection" is still a desideratum. Briefly summarised, these facts are as follows:—

(A.) "Pneumococcus infection" may be manifested in man as a fibrinous inflammation; for instance, in pneumonia, in which case the disease is not to be distinguished from similar lung affection in relation with which the diplococcus in question is not to be detected.

(B.) "Pneumococcus infection" may be manifested in man as a true suppurative affection, in which case the malady induced is not distinguishable from suppuration associated with so-called "pyogenic germs."

(C.) "Pneumococcus infection" may be manifested in man as a serous exudation, without fibrinosis and without suppuration, a condition that is not to be distinguished from others in association with which this diplococcus is not found.

(D.) "Pneumococcus infection" is manifested in man as septicæmia or as pyæmia, indistinguishable again from like disease associated with other and diverse microbes.

(E.) Furthermore, and as regards pneumonia, the disease of the human subject specially in question, this diplococcus—derived indifferently from one and another source (inclusive of croupous pneumonia) —when injected in pure culture into rodents, induces in these animals *not pneumonia*, but other malady. Sometimes this other malady is mere local inflammation, sometimes it is a general septicæmia, or, may be, no illness at all ensues on such injection.

It would seem, therefore, that if the diplococcus in question be to any extent responsible for human maladies so widely removed—clinically, histologically, and pathologically—from each other as some of those here recorded, such disease manifestations as are in the human subject associated with this diplococcus must be *governed*, under different conditions, now by one, now by another factor, to which the particular diplococcus is in each instance subordinate.

No. 9.

Further Report on the Chemical Pathology of Tetanus, by Sidney Martin, M.D., F.R.S., F.R.C.P.

In my last report I dealt with the nature and physiological action of the toxic substances found in the bodies of patients who had died of acute traumatic tetanus. It was there shown that the same classes of substances as in anthrax, ulcerative endocarditis, and diphtheria were present, viz., substances belonging to the group of albumoses, or digested proteids, and certain substances, non-proteid in nature, some of which were soluble, while others were insoluble, in ether. The albumoses were found to produce fever when injected intravenously into rabbits, but they showed no other specific action, producing no tetanic spasms and in most instances no profound effect on nutrition. The substances insoluble in ether were found to have no physiological action when injected in large doses intravenously in rabbits; in no instance were the muscular spasms characteristic of tetanus produced. On the other hand, the substances soluble in ether (as well as in alcohol) produced spasms and rapid death when injected intravenously. The ether extract contained fatty substances, but also a tetanus-producing body (or bodies) which, from the small amount of material at disposal, it was found impossible to isolate and purify.

These results do not include all the points in the chemical pathology of tetanus which it is necessary to elucidate. The results previously recorded contrast strongly with those found in diphtheria, in which from the spleen and blood of patients dying from the disease albumoses and an organic acid were separated, but it was the former alone which reproduced the symptoms and pathological change of the disease, viz., a progressive palsy dependent on a nerve degeneration, and an associated fatty degeneration of the heart. Moreover, in the false membrane of diphtheria there was found an active poison, closely resembling that described by Roux and Yersin as produced by the bacillus diphtheriæ, and which is best referred to as the "toxin" of diphtheria. It was suggested in my Report on the Chemical Pathology of Diphtheria that the same relation existed between the toxin present in the diphtheritic membrane and the albumoses found in the spleen and other tissues as between pepsin or pancreatin and their digestive products, viz., that the toxin was a proteolytic ferment which digested proteids of the body, producing albumoses and an organic acid. Direct proof of this is not as yet forthcoming, since all attempts to demonstrate the proteolytic action of the diphtheria toxin have failed in my hands.

In tetanus the same problem presents itself, since there is a toxin produced by the bacillus tetani which closely resembles the diphtheria toxin in many of its properties, and there are the final products, albumoses and toxin substances, soluble in ether, which are found in appreciable quantities in the tissues (especially the spleen) of patients dying from the disease.

From the researches of Nicolaier, Rosenbach, Flügge, Kitasato, and others, the close association of the bacillus tetani with acute traumatic tetanus and tetanus neonatorum has been demonstrated. In all early cases of the disease the bacillus has been found either in the ichorous pus of the wound or in the pus clinging to the splinter of wood or foreign body which has been removed. The bacillus produces a toxin, the effects of which are discussed later on. I did not find it in the tissues of patients dying of the disease, although Kitasato has found that the heart-blood of patients dying of tetanus produces tetanic convulsions in mice when given in relatively large doses, viz., 0·2 to 0·3 cubic centimetre. He also found that in animals killed with the bacillus tetani the heart's blood was toxic, but not infective, viz., it contained a tetanus-producing poison, but no bacilli. Kitasato came to the conclusion that this poison present in the blood was the "toxin," which is readily prepared artificially by growing the bacillus in a suitable medium, and, as far as our knowledge at present extends, his conclusion is probably correct. If this be so, poisons are circulating in the blood of patients with tetanus which are of a different nature to those described in my last report, viz., the albumoses and the tetanus-producing substances soluble in ether. In tetanus, therefore, as in diphtheria, we are confronted by the problem of a virulent toxin and less virulent albumoses; but although in both tetanus and diphtheria the toxin has a physiological action which reproduces the characteristic feature of the disease, the albumoses in tetanus do not reproduce the main feature of tetanus (viz., muscular spasms), while in diphtheria the palsy and nerve degeneration result from their action. Moreover, the final product in tetanus (viz., the substance soluble in ether) is a tetanus-producing body, while in diphtheria it possesses little or no physiological action.

Further researches are necessary regarding the extent to which the tetanus toxin is present in the local lesion and tissues of patients dying from the disease. The methods used in the researches published in my last report do not lead to a conclusion one way or the other; since the prolonged treatment with alcohol and repeated drying of the products, even at the low temperature employed, would tend to diminish the activity of the toxin, if it were present, and eventually to destroy it. In the present report I shall deal (1) with some further effects of the tetanus albumoses obtained from the spleen of patients dying of the disease; (2) with some of the properties of the tetanus toxin obtained by growing the bacillus tetanus in a suitable medium; and (3) incidentally with the action of the tetanus anti-toxin.

Physiological Effects of the Tetanus Albumoses.

The physiological effects of the tetanus albumoses which were recorded in my last report were chiefly negative. In doses of 0·2 gramme per kilo of body weight in rabbits, they produced some degree of fever, but no other appreciable symptoms; wasting occurred in only one instance; it was the exception, and there was no diarrhœa, nor were any tetanic spasms produced. A further experiment was performed with the object of discovering the effect of larger doses of the albumoses, and also whether the fatty degeneration of the heart muscle was produced as in poisoning by the albumoses of anthrax, ulcerative endocarditis, and diphtheria.

Two rabbits, which were under observation some time before the experiment, were taken: Into the marginal vein of each about 0·4 gramme albumoses per kilo of body weight was injected, in two doses. In one animal the albumoses were given dissolved in a small amount of water; in the other, 0·2 gramme of tetanus anti-toxin was mixed with the albumoses before solution and injection. This parallel experiment with the anti-toxin was performed to compare with similar experiments with the diphtheria albumoses and anti-toxin. The diphtheria anti-toxin completely counteracts the effect of the albumoses in producing fatty degeneration of the heart; and it was desirable to see whether the tetanus anti-toxin had a similar effect, as well as whether the tetanus albumoses were capable of producing this fatty degeneration. The result of the experiment, as shown below, demonstrates that the albumoses in this large dose produced but little fever, and had no effect on the body weight, *i.e.*, on the general nutrition; and that, to all appearances, both the animal that received the albumoses alone and that which received the anti-toxin as well, remained normal throughout the experiment. Both animals were killed on the 29th day of experiment.

STATEMENT showing the Effect of the INTRAVENOUS INJECTION of TETANUS ALBUMOSES in RABITBS (0·4 Gramme per Kilo of Body Weight) and the Effect of TETANUS ANTI-TOXIN.

Rabbit I. Albumoses alone, 0·3 g., in two doses, each dissolved in water.					Rabbit II. Albumoses, 0·3 g. + 0·4 g. anti-toxin mixed. In two doses, dissolved in water.	
Date.	Time.	Temp.	Weight.		Temp.	Weight.
1895. Oct. 31	6 p.m.	103·	700 grammes	Average temperature before injection, 103° F. Average temperature before injection, 103° F.	102·8	700 grammes.
Nov. 1	10 a.m.	103·	- - -		102·8	
Nov. 1	2 p.m.	103·	730 grammes		102·8	710 grammes.
Nov. 1	6 p.m.	103·4	- - -		103·2	
Nov. 2	10 a.m.	103·	- - -		102·8	700 grammes.
Nov. 2	2 p.m.	103·	- - -		102·6	
Nov. 4	10 a.m.	103·4	750 grammes		103·8	750 grammes.
Nov. 4	2 p.m.	103·	- -		103·2	
Nov. 4	6 p.m.	103·2	- - -		103·2	
Nov. 5	10 a.m.	102·2	750 grammes		103·2	730 grammes.
Nov. 5	10.30 a.m.	1st injn. marginal vein, 0·15 g. alb. in 1 c.c. H_2O.			1st injn. marginal vein, 0·15 g. alb. + 0·2 anti-toxin in 0·7 c.c. H_2O.	
Nov. 5	12.0	102·2	- - -	Average temperature after 1st injection, 102·9° F. Average temperature after 1st injection, 103·1° F.	102·2	
Nov. 5	2 p.m.	103·	- - -		103·2	
Nov. 5	4 p.m.	103·	- - -		103·2	
Nov. 5	6 p.m.	102·4	- - -		103·2	
Nov. 5	8 p.m.	103·	- - -		103·4	
Nov. 6	10 a.m.	103·	750 grammes		102·8	700 grammes.
Nov. 6	12.0	103·	- - -		103·	
Nov. 6	2 p.m.	103·	- - -		103·2	
Nov. 6	4 p.m.	103·	- - -		103·2	
Nov. 6	6 p.m.	103·	- - -		103·2	
Nov. 6	8 p.m.	103·2	- - -		103·2	
Nov. 7	10 a.m.	103·2	750 grammes		103·6	700 grammes.
Nov. 7	12.0	103·2	- - -		103·6	
Nov. 7	2 p.m.	103·	- - -		103·4	
Nov. 7	4 p.m.	102·8	- - -		103·	
Nov. 7	5 p.m.	2nd injn. marginal vein, 0·15 g., alb.			2nd injn. 0·15 g. alb. + 0·2 g. anti-toxin.	

Rabbit I.—*cont.* Albumoses alone, 0·3 g., in two doses, each dissolved in water.				—	Rabbit II.—*cont.* Albumoses, 0·3 g. + 0·4 g. anti-toxin mixed. In two doses, dissolved in water.	
Date.	**Time.**	**Temp.**	**Weight.**		**Temp.**	**Weight.**
1895.						
Nov. 7	6 p.m.	103·	- - -	Average temperature after 2nd injection, 102·9° F. Average temperature after 2nd injection, 103·5° F.	102·2	
Nov. 7	8 p.m.	102·8	- - -		102·6	
Nov. 8	10 a.m.	102·8	780 grammes		103·4	750 grammes.
Nov. 8	2 p.m.	103·	- - -		103·	
Nov. 8	4 p.m.	103·	- - -		103·	
Nov. 8	6 p.m.	102·8	- - -		102·8	
Nov. 9	2 p.m.	103·	- - -		103·2	
Nov. 11	10 p.m.	101·	750 grammes		103·4	750 grammes.
Nov. 12	12.0	—	750 "		—	750 "
Dec. 3	Killed	—	800 "		Killed	800 "

The total gain in weight of Rabbit I. was 50 grammes in the 29 days, and of Rabbit II., 70 grammes.

No general symptoms were exhibited by either animal during the 29 days.

A post-mortem examination was made immediately after killing, and there were no naked eye signs of any morbid lesion, except that in Rabbit I. the liver showed the white patches of a parasitic (bacterial) disease, which is so common in these animals and in guinea-pigs. Portions of the left ventricle of the heart from each animal were stained for 48 hours in osmic acid, as well as one phrenic nerve and one anterior crural nerve with its branches. The changes found are as follows:—

Rabbit I.—Injected with albumoses alone.

1. The left ventricle showed on microscopical examination no fatty degeneration of the muscle fibres; these appeared quite normal, the transverse striation being well seen.

2. The muscle fibre of the diaphragm showed no fatty degeneration. The phrenic nerve itself, and especially its small branches on the diaphragm, showed numerous areas of interrupted degeneration of a character precisely similar to that which I have described as occurring in diphtheria (*see* Report on Chemical Pathology of Diphtheria). Thus in one small branch which divided into two, two areas of degeneration were found in the nerve before division, two similar areas in one of the branches, and one in the other. The degeneration had proceeded only as far as a loss of the white substance of Schwann, the degenerating areas not staining with osmic acid. No rupture of the axis cylinder was noted, and the change was altogether only in an early stage, as evidenced by the absence of fatty degeneration of the muscles of the diaphragm.

3. The muscular branches of one anterior crural nerve were teased after staining in osmic acid, and areas of interrupted degeneration were seen similar to those just described. The change, therefore, was not confined to the phrenic nerve, but was observed in the nerves of the body.

Rabbit II.—Injected with albumoses and tetanus anti-toxin.

1. There was a slight amount of fatty degeneration in the muscle fibres of the heart. Some of the fibres were quite normal, while others showed minute granules stained black with osmic acid.

2. The muscle fibres of the diaphragm were normal, but on teasing the trunk of the phrenic nerve numerous areas of interrupted degeneration were observed.

3. In the muscular branches of one anterior crural nerve numerous areas of degeneration were also noted, some of which, as in the phrenic nerve of Rabbit I., were visible to the naked eye after staining with osmic acid.

The pathological results of the albumoses in the two animals were therefore similar, and the anti-toxin did not appear to have any influence (although a relatively large dose was given) in counteracting these results.

A comparison may be made between the physiological effects of the tetanus albumoses and those of anthrax, ineffective endocarditis, and diphtheria, which have been discussed in previous reports.

1. As regards the albumoses of anthrax and infective endocarditis, tetanus albumoses may be contrasted in these points:—In their fever-producing qualities they are far behind those of anthrax and endocarditis. Especially in the case of anthrax, these albumoses produce high fever, and after the repeated injection of small doses, continuous fever for some days. Indeed, the tetanus albumoses are not so potent as fever producers as the albumoses formed by pepsin. Again, they are less effective than the albumoses of anthrax and endocarditis in producing fatty degeneration of the heart. Lastly, they produce a moderate degree of nerve degeneration of the same nature as observed in diphtheria, a result which has not been observed after the intravenous injection of even large doses of the anthrax or infective endocarditis albumoses.

2. Tetanus albumoses more closely resemble those found in diphtheria, although they are much weaker in their effect. Thus in both cases there is an irregular effect on the body temperature, which is more uncertain in the case of the tetanus than in that of the diphtheria albumoses. The tetanus albumoses have but slight effect in producing fatty degeneration of the heart, which is a marked result of the diphtheria albumoses The point in which they both agree, and one which it is of high interest to note, is that they both produce nerve degeneration. In the case of diphtheria albumoses, this nerve degeneration is a well-marked feature of the poison; it is progressive, and is shown by early symptoms of palsy. In the case of the tetanus albumoses, the nerve degeneration is slower in origin; it is not so extensive, and was not shown, in the experiments recorded in this and the last report, by the symptoms of palsy. The discovery of the effect of the tetanus albumoses in producing nerve degeneration may be the key to the explanation of the occurrence of the so-called cases of "cephalic" tetanus. In the ordinary cases of traumatic tetanus there is no paralysis, possibly because the patient does not live long enough; but in cases of cephalic tetanus, palsy is associated with spasm of the muscles of the head or neck. Whether cephalic tetanus be due to the same micro-organism as traumatic tetanus it is at present impossible to say. But it might be contrasted with the latter disease as an infective disease in which palsy is associated with tetanic spasms, while the chief feature of acute traumatic tetanus is the production of muscular spasms, palsy being only a potentiality as shown from the pathological effects of the albumoses obtained from patients dying of the disease.

Diphtheria, on the other hand, is a disease in which there is no spasm; palsy (due to a nerve degeneration) and a degeneration of the cardiac muscle being the chief features.

The discovery of the power of tetanus albumoses to produce a nerve degeneration is perhaps not, on consideration, a surprising fact, since there are so many infective disorders which are occasionally followed by a palsy dependent on a peripheral neuritis. Typhoid fever and various forms of septicæmia may be cited as examples. Moreover, in tetany, a disease which in some of its aspects resembles an infective disease, or the results of one, there is a slow and intermittent spasm of the skeletal muscles, which can be induced by various mechanical and electrical means. Yet, in one case of tetany in a child, I found in all the nerves examined (viz., in the phrenic and in some of the muscular branches of the anterior crural) interrupted nerve degeneration, which was microscopically indistinguishable from that observed after the injection of tetanus albumoses or in the early stage of the nerve-change in diphtheria.

The effect of tetanus albumoses in producing nerve degeneration brings tetanus and diphtheria into a clear pathological parallel. Although the features of the disease are widely different, yet (1) the infective agent in both produces a virulent toxin, which kills in infinitesimal doses; (2) in both, albumoses and final non-proteid products are found in the tissues after death, whereas in diphtheria it is the albumoses which are the chief agent in producing the characteristic pathological effect; in tetanus it is a non-proteid body soluble in ether; (3) in both diseases the albumoses produce a nerve degeneration, widespread and progressive in the case of diphtheria, slight in the case of tetanus; (4) in both there is an action on the motor cells of the anterior cornua of the cord. In tetanus the spasms are due to this action. In diphtheria the effect on the cells of the anterior cornua is not evidenced in rabbits; but it was well shown in the case of the monkey recorded in my report on the symptoms of diphtheria in relation to its chemical pathology (Report Medical Officer of Local Government Board, 1892–93), and excessive pigmentation of these cells has been noted in death from diphtheria in man, and fatty degeneration and vacuolation of them have been observed in those dying of diphtheria paralysis some time after the acute disease.

Physiological Effect of the Toxin of the Bacillus Tetani.

The term toxin is best reserved for the poisonous substance which is produced both by the bacillus tetani and the bacillus diphtheriæ, when grown in a culture fluid not containing a digestible proteid. Such a culture fluid is one made of meat broth, rendered alkaline with carbonate of sodium, and containing 0·75 gramme per cent. of sodium chloride and from 1 to 2 per cent. of commercial peptone. In this purely artificial culture medium, resembling no actual medium in the body, both the bacillus tetani and the bacillus diphtheriæ will grow. For the vigorous growth of the latter oxygen is supplied by a current of air; for the former, oxygen must be excluded, so that the bacillus grows best in an atmosphere of hydrogen. It is best also to add from 1 to 2 per cent. of glucose to the culture medium, as the sugar appears to stimulate the growth.

The toxin which is formed under these conditions in the course of one, two, three, or four weeks has been studied by many observers; Kitasato,* Behring, Vaillard, &c. Kitasato was the first to study it with any degree of accuracy, and it was he who demonstrated its extraordinary toxicity. In infinitesimal doses it is fatal to mice, guinea-pigs, and rabbits; the last are the least susceptible to the poison, while guinea-pigs are the most susceptible, being slightly more so than mice.

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* Kitasato, Ztschr. f., Hyg. u.s.w., 1891, Vol. X., p. 267.

The toxin is very sensitive to heat. When heated at 65° C. or above for five minutes, it is completely destroyed; it withstands 15 minutes heating at 60°, and 1¼ hours at 55°, and much longer periods at lower temperatures.

It can be dried over sulphuric acid without loss of toxicity; but this is diminished if it is dried in the incubator. It is destroyed in 9 or 10 weeks by diffused daylight; but it requires only 15 to 18 hours of direct sunlight to completely destroy it. Kitasato further states that the toxin is not precipitated by alcohol, a statement which it is difficult to accept.

The toxin was prepared as follows:—Novy's bottle was used as a cultivating flask. It is a glass-stoppered bottle, with an entrance and exit tube, each having a stop-cock; and thus permitting a current of hydrogen to be passed through. The exit tube was connected with a bent tube, the end of which was under mercury, so that any variation in pressure in the culture medium and atmosphere above it would not displace the stopper of the bottle, and thus let in oxygen. When the bottle was ready to be placed in the incubator all junctions were covered with melted paraffin.

The culture fluid used was faintly alkaline beef broth, containing 1 per cent. of peptone and 1 per cent. of glucose.

The specimen of bacillus tetani used was obtained from Dr. Sims Woodhead, Director of the Laboratory of the Royal College of Surgeons and Physicians. Its virulence was tested on a guinea-pig. A small portion of the culture was mixed with 0·3 cubic centimetre sterile broth, and injected under the skin of the groin. The animal died in 24 hours; post-mortem local ecchymosis was found, with some general congestion of the lung, but no other morbid signs.

The clear culture, after inoculation, became turbid in two days; the growth became vigorous, and a negative pressure appeared in the bottle, increasing to 2 inches of mercury up to the 16th day of cultivation, after which it rapidly disappeared. The culture was filtered on the 31st day. It had the characteristic smell of a culture of the bacillus tetani, and was not contaminated.

The culture was filtered through a Chamberland's filter to remove the micro-organisms, and with the clear brown slightly alkaline filtrate, the following experiments were performed:—

Guinea-pig I. 500 g.: received 0·5 c.c. of filtrate subcutaneously in right groin.
„ II. 500 g.: received 0·5 c.c. of filtrate subcutaneously in right groin.
„ III. 500 g.: received 1·0 c.c. of filtrate subcutaneously in right groin.
„ IV. 500 g.; received 2·0 c.c. of filtrate subcutaneously in right groin.

None of the animals showed any symptoms until about 48 hours after the injection, when convulsions were first noted. These became general, and all the animals died during the night; that is, in about 70 hours after the injection. The animals, indeed, showed the well-known features of tetanus. A post-mortem examination showed nothing very abnormal. The cortex of the kidney was rather pale; the lungs were patchily congested; the spleen was not enlarged.

App. B. No. 9.

On the Chemical Pathology of Tetanus; by Dr. Sidney Martin.

In another experiment the effect of tetanus anti-toxin in counteracting the poison was tested. The anti-toxin serum was received from Dr. Ruffer, Director of the British Institute of Preventive Medicine.

Guinea-pig I. 490 g.: received 0·25 c.c. of filtrate subcutaneously.
" II. 500 g.: received 0·5 c.c. of filtrate subcutaneously.
" III. 475 g.: received 0·25 c.c. of filtrate subcutaneously mixed with 0·5 c.c. of anti-toxin serum.
" IV. 510 g.: received 0·5 c.c. of filtrate mixed with 0·5 c.c. anti-toxin serum.
" V. 450 g.: received 0·5 c.c. of filtrate mixed with 1 c.c. of anti-toxin serum.

Guinea-pigs III., IV., and V., those that received the anti-toxin serum as well as the toxin, showed no symptoms whatever either during the first three weeks of close observation or in the five or six months during which they were kept. When killed, they were fat, and had increased greatly in size.

Guinea-pigs I. and II. exhibited the same phenomena. There were no symptoms to be observed during the first 48 hours after the injection. At that time the leg over the seat of injection was observed to be stiff; and from that time onward till death, in under 72 hours, the symptoms were those of spasms of increasing intensity.

A post-mortem examination revealed no well-marked morbid change. The spinal cords of both animals were examined by means of sections after hardening in Marchi's fluid, but nothing abnormal was to be detected in the ganglionic cells of the anterior cornu. At the same time the dorsal cord from a case of traumatic tetanus in man was examined, and no change could be detected in the ganglion cells of the anterior cornu.

The filtrate containing the toxin of the tetanus bacillus used in these experiments was not of so active a nature as that used by Kitasato in his research (*op. cit.*). But the results obtained bring out very clearly one striking feature of the action of the poison, which is more manifest when a weak, instead of a strong, toxin is used. This feature is of twofold aspect. In the first place, the effect of the toxin is not so dependent on dosage as in the case of mineral or organic (non-proteid) poisons. The six animals injected with doses varying from 0·25 cubic centimetre to 2·0 cubic centimetres began to exhibit tetanic spasms, and died, at about the same time. No difference as regards symptoms could be detected between them. In the second place, the tetanic spasms, the characteristic symptoms of the disease, did not appear until about 48 hours after injection; and after their appearance they rapidly increased in intensity, and the animal finally succumbed. The question as to what is happening in the pre-tetanic, the incubative period, is of the first importance. The condition of things is precisely what occurs when a living micro-organism is injected into an animal. Although the effect is to some degree proportional to the dose (*i.e.*, the number) of micro-organisms injected, yet there is always a quiescent or incubative period, reckoned by hours, during which no change in the animal is detected. In the case under consideration there are no micro-organisms, but a soluble substance which cannot of itself multiply. The only agents, the products of the living cell, which are known to act in this manner are ferments. No amount of toxin injected will immediately call forth the exhibition of tetanic spasms. The conclusion, therefore, must be, that the direct tetanizing agent, *i.e.*, the substance which acts on the spinal cord is not the toxin itself, but some derivative of it. In all my previous reports there has been evidence brought forward, in the case of anthrax, of diphtheria, and of endocarditis, to show that in these infective diseases a digestive action on the proteids of the body is progressing; digestive products (albumoses and other substances) are found which can only be formed by a proteolytic action of some ferment on the proteids of the body. The bacillus anthracis forms no virulent toxin like the bacillus tetani and the bacillus diphtheriæ. When the bacillus anthracis is grown in peptone-broth in a manner similar to the two other bacilli, and the culture filtered to remove the micro-organisms, the filtrate is found to be practically innocuous. Even large quantities, when injected, will produce no symptoms to be ascribed to the presence of a toxic principle by the bacillus. It will, however, digest proteids with the formation of poisonous products, which have been fully described in my previous reports. In the tissues of patients dying of tetanus and diphtheria, digestive products are found, and the suggestion previously made by me regarding diphtheria seems to be true as regards tetanus, viz., that the toxin is in all probability a proteolytic ferment, and that the albumoses, &c., are the products of its activity. And in tetanus it is not until these products are formed that the spasms are exhibited. An experiment was made to determine whether the tetanus toxin had any proteolytic action outside the body. The toxin was the same filtrate tested in the recorded experiments, and was used directly after the culture was filtered. The proteolytic action was tested on a solution of alkali albumin (about 1 per cent.) nearly neutral, and sterilized.

Three flasks were employed: No. 1 contained 40 cubic centimetres of the alkali albumin solution and 10 cubic centimetres of the tetanus filtrate. The liquid was boiled after mixing to destroy the toxin. This flask served as a control. Flask 2 contained the same proportions of alkali-albumin solution and toxin, but was unboiled. Flask 3 contained 90 cubic centimetres of alkali-albumin solution and 10 cubic centimetres of toxin. Thymol was added to prevent putrefaction. The flasks were placed in the incubator at 98° F., and were tested from time to time during a period of 40 days. No change whatever could be discovered in any of them during this time. At the end the biuret reaction (test for peptone) was as bright in the control as in the other two flasks: and the alkali albumin gave all the ordinary reactions, showing that it was unchanged. Although, therefore, the tetanus toxin possesses no evident proteolytic action outside the body, this fact does not exclude a similar action in the living body.

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